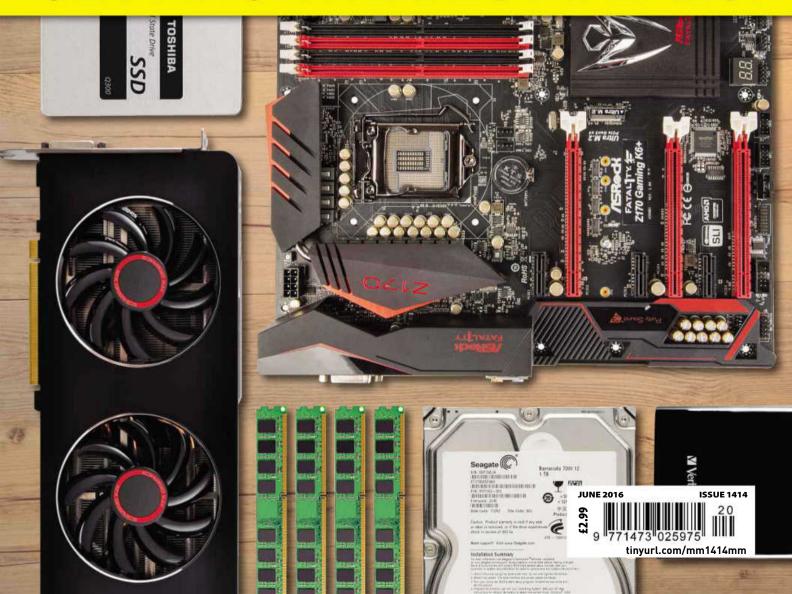# micro mart

Computing in the know

Plus

- Why Intel Is Leaving The Mobile Sector Behind
- How To Make Your Own Spectrum Loading Screens
- Learn To Touch Type And Have Fun At The Same Time

MOTHERBOARDS, CPUs, RAM & MORE
GETTING THE BEST DEALS!

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CPU AND MOTHERBOARD DEALS

Getting the right motherboard and processor combination – at the right price – is key

The starting point of any system is its CPU and Motherboard combination. These two components are built to fit one another with a particular socket and chipset combination, so it makes sense to choose them both at the same time.

When choosing a CPU or a motherboard there are a whole confusing host of options open to you, all which are fairly similar in design and compatibility, but different in function and capability. To help you understand what will suit your needs best, we'll explain which processors are good for which purposes, explain how to match them up with the right motherboard, and point you in the direction of some deals and offers that might help sway your decision one way or the other.

CPUs: What To Look For

There are two main manufacturers of desktop CPUs: AMD and Intel. Historically, they have jockeyed for market position, but the last couple of years have seen Intel take a convincing lead in performance, forcing AMD to compete on price. The upshot is that current AMD chips perform comparatively badly for single-thread and CPU-intensive tasks, but can be used to build a cheaper system.

The problem for AMD is that desktop systems are frequently employed for entertainment and gaming, both of which favour the single-threaded performance that Intel does so well. That doesn't write off AMD completely, though: if you're building a low-cost system, those based on AMD's technology are usually cheaper, even if the relatively low performance makes them worse value.

AMD currently has two main lines: the A-Series chips are CPUs with integrated GPUs (what AMD call APUs – 'Accelerated Processing Unit') and the FX series are standard, processor-only chips with no graphics capabilities. A-series processors are good for low-budget systems, while FX chips make most sense paired with a graphics card.

Intel, by comparison, have three main desktop lines – Core i3, Core i5 and Core i7. At retail, they're mostly spread over two release iterations: Skylake and Haswell. Core i3s are low-end, casual-use chips, Core i5s are aimed at more serious users, and Core i7s are aimed at specialist users and performance enthusiasts.

Although Core chips do contain onboard graphics (like AMD's A-series chips) it's worth pointing out that these aren't really suitable for gaming. If

you're planning on buying a separate graphics card, the Core CPUs are a good choice, but if you can't commit the extra funds then an A-series will offer better graphics than you can get from even a higher-end Core CPU.

Intel CPU Deals

Budget: Core i3-4150 (£93)

Intel's idea of a 'low-end' CPU isn't the same as most people's, but the Core i3 line of chips is designed for everyday, non-intensive use, and they're very good at their job. Haswell chips are 5%-10% slower than their more expensive Skylake counterparts and not a huge amount cheaper, but you will save on the motherboard. Make sure you consider whether it's a false economy – these chips are old and will hit the end of their lifespan much sooner than a Skylake one will.

The Core i3-4150 supports hyper-threading and has an onboard Intel HD Graphics GPU, which isn't as good as the graphics on higher-end AMD APUs, but is still more than adequate for non-gamers. The only real downside is that – as with all Core i3 CPUs – the Core i3-4150 is multiplier-locked, so overclocking isn't possible in any major way. You can't squeeze it for performance like you might a similarly priced AMD chip.

Mid-Range: Core i5-6500 (£171)

In terms of raw capabilities, the Core i5-6500 isn't much different to its near-identical predecessor, the i5-4570, but we think the new Skylake features – a better onboard GPU, greater efficiency and cooler temperature – are worth paying for even if the chip costs a little extra. Again, if you go with a Haswell model the appropriate motherboard will be cheaper, so that's worth considering, but all other things being equal this is the better CPU, and being on the newer platform (with, for example, DDR4 compatibility) is going to be worth it in the long run.

High-End: Core i7-6700K (£275)

Intel's dirty secret is that the Core i7 chips, by almost any practical measure, aren't much better than the Core i5s, being largely tuned for the kind of multi-threading performance that most people don't really do on their home PCs. That doesn't stop the i7-6700K being the best high-end desktop chip it offers, though. The onboard Iris GPU isn't much use – there's almost no point getting a chip like this if it's not paired with a graphics card – but other than that, it's nearly flawless. Even if you're just gaming with it, you can

expect superb performance above any of Intel's slower chips – and the unlocked multiplier means you can pair it with a Z-series motherboard to get even faster speeds.

AMD CPU Deals

Budget: A6 6400K (£42)

Despite being a budget chip, the AMD A-Series A6-6400K includes an unlocked multiplier, which means it's possible to overclock it. Compared to the locked Intels you find at this price range, that's a huge plus point, even if AMD chips don't overclock half as well as Intel's. The HD 8470D graphics chip on the processor is notably superior to the GPU on Intel's similarly priced offerings, and for extra power, it can be run in a crossfire configuration with a similar graphics card, which is a potential boon for budget gamers. It's tough to recommend unless you're pressed for cash, but if you are we'd rather have this than anything else in the same price range.
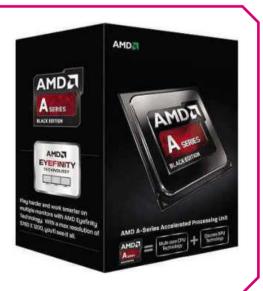
High-End: AMD A10 7850K (£90)

Although no high-end AMD system is going to match the capabilities of an high-end Intel one, you can still put together a set of hardware that'll give you a passable gaming PC when paired with a decent graphics card. When you get to building faster systems, though, the low budget appeal of AMD chips is less helpful, because it's no use saving money on a performance system. That doesn't mean it's completely pointless, especially if you want a fast, uncomplicated PC.

For £90, this Kaveri A10 7850K CPU gives you an R7 graphics GPU with visual performance far beyond what any Intel chip can provide on its own. It might not be the best choice for gaming, but it's passable, and if that saves you £100-£200 on a separate graphics card then it's probably worth doing when saving money is important. The place where it can really help is if you're building some kind of HTPC or similarly specialised system – that way, you get smooth HD video performance without the high price of Intel hardware or a separate graphics card, saving on noise levels and power draw at the same time.

> ❝ **Intel's idea of a 'low-end' CPU isn't the same as most people's, but the Core i3 line is designed for everyday, non-intensive use** ❞

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Motherboards: What To Look For

Above all else, Motherboards must match the CPU you're putting in them. Once you've made sure of that, you're just negotiating specifics. Of course, those specifics range from the relatively inconsequential (such as how many USB sockets it has) to the rather quite important (what chipset it uses) so, having helped you choose a CPU, we'll now point you in the direction of a compatible and appropriate motherboard.

Currently, Intel's motherboards use either Socket LGA-1150 (for Haswell chips) or LGA-1151 (For Skylake chips). AMD's most recent sockets are still AM3+ and FM2. Against expectations (or at least, against alliteration) the former is used for FX series chips, while the latter is used for A-Series chips. That said, AMD's forthcoming Zen chips will use AM4 (previously expected to be called FM3) but it'll be months until FM3 chips and boards are released – October at the earliest.

Once you know the motherboard can accept the CPU you're planning to buy, you can set about deciding on what other features are important to you. For the most part this'll involve choosing the number of USB ports, PCI slots and SATA connectors, but do beware: some motherboards have quirks that can cause unexpected trouble. Certain chipsets are multiplier-locked, meaning they can't be used with overclocked chips. Others may omit support for GPUs, mandating the use of a separate graphics card. Some save space by providing only two RAM banks. Where these things might be an issue we've highlighted them, but if you're picking one on your own, don't forget to do some research first!
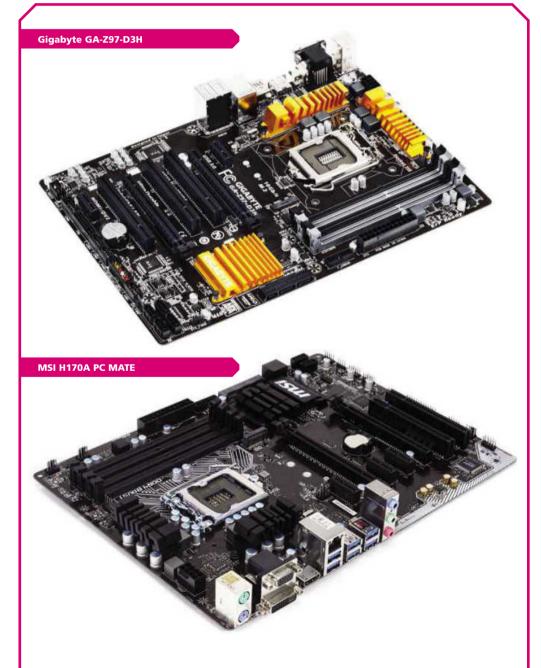
Once you're confident about features, you'll need to pay attention to the form factor, which will probably be ATX or microATX. The majority of desktop PCs use an ATX form, and virtually any desktop case will have space and mountings for both ATX and microATX boards. If you're not sure what to buy, make it ATX – or check your case to make sure what boards it's designed for.

Intel Motherboard Deals

Budget: Gigabyte GA-Z97-D3H (£53)
Gigabyte's Z97 motherboard is as cheap as Socket 1150 boards come if you don't want the inconvenience of a microATX board – and if you're building a desktop PC we'd always recommend going for the full ATX size, if only so you can fit in expansions further down the line. This board is a Z97 chipset, which means it's also capable of supporting chips all the way up to a Core i7 as long as it's Haswell, complete with overclocking features. For us, that's worth the £15 extra you'll pay over a less-capable Haswell motherboard because of the future-proofing it offers, but if you don't mind a stripped back PC, look for an H81 board instead – Gigabyte's cheapest is the GA-H81M-H, and that's a solid choice too at £36.

Mid-Range: MSI H170A PC MATE (£81)
Intel's H170 is aimed at mainstream PCs, broadly replacing the Ivy Bridge H77, Haswell H87 and Devil's Canyon H97. Although considered mid-range boards, their support for high-end features is more than enough for most home users, with up to sixteen PCI-E lanes (allowing for SLI mode graphics). This particular board has six SATA 6Gb/s

Gigabyte GA-Z97-D3H

MSI H170A PC MATE

ports, M.2 and SATAe ports, built-in HDMI, DVI-D and VGA, eight USB 3.1 ports and four USB 2.0 ports, built-in gigabit LAN and support for DDR4 memory. As long as you don't want to overclock your CPU this is as good a motherboard as you can get, and perfectly pairs with any (locked) Core i5 chip.

High-End: ASRock Fatal1ty Z170 Gaming K6 (£142)
There are more expensive motherboards around, but the ASRock Fatal1ty Z170 gaming board is enough for most home systems. As well as all the features of the H710 chipset, the Z170 supports full overclocking of both CPU and RAM, and the ASRock Fatal1ty line features gold-plated connectors to facilitate electrically clean and high-quality connection between components. Of particular note is its dual BIOS, which allows you to have a backup BIOS spare in case of an upgrade disaster – an essential feature for anyone who likes to keep their board on the

ASRock Fatal1ty Z170 Gaming K6

Asrock FM2A78 Pro4+

Asus A88X-GAMER

> **The forthcoming release of Zen and AM4-socket chipsets means FM2+ setups are on their last legs**

cutting edge of firmware updates. Remember to double-check which board you're buying though – some cheaper versions of the Fatal1ty actually use DDR3, which is an option for Skylake systems – just not the best one if you're trying to build something high-end!

AMD Motherboard Deals
Budget: Asrock FM2A78 Pro4+ (£66)
If you're buying an FM2 or FM2+ chip, it's hard to find a board cheaper than this without resorting to under-sized examples. The Asrock FM2A78 Pro4+ is pretty standard, with four DDR3 DIMM slots, triple monitor support and onboard gigabit LAN. It has three PCI-E slots and dual-graphics support, with five SATA 3.0 ports. The only area it's even slightly lacking is in USB support, because the A78 chipset only has three USB 3.0 ports by default, with the rest being USB 2.0. Overclocking support is best described as limited, but it's available, and that's enough to avoid the extra expense of a more capable board if you're trying to build a budget system. The only reason we wouldn't go cheaper

than this is because you're going to need space for RAM, which this has – and, being a DDR3 board, you can (and should) re-use your old DIMMs in it.

High-End: Asus A88X-GAMER (£95)
The A88X chipset supports full overclocking on AMD chips and is a great choice for anyone building a high-end AMD-based system – at least for the moment, that is. We should once again point out that the forthcoming release of Zen and AM4-socket chipsets means any FM2+ based setups are on their last legs (its kit that still supports DDR3 rather than DDR4, after all) but if you can't wait, it's the one to go for right now. Overclocking aside, The features in this board aren't all thatfar beyond the Asrock board we just looked at, but it does have eight SATA 3.0 ports, four USB 3.0 ports and ten USB 2.0 ports, as well as optical audio out, so if they are worth an extra £30 of your money, then go for it. By our reckoning, you don't need to spend any more on an AMD board right now – though, to be fair, looking at the market you'd struggle to! **mm**

GRAPHIC CARD AND MONITOR DEALS

Give yourself a visual treat, with this fine selection of goodies…

> ❝ **Graphics cards are essentially separate processors that sit inside your system handling nothing but the graphics output** ❞

It's remarkable how much improving the look of your system can make it feel like something new and exciting. You might not have changed the internals much, but your desktop is the main point of contact you have with a desktop computer. Upgrade that and it'll seem as though everything old is new again.

This means two things: finding a new monitor and ideally a graphics card to go with it. Both are expensive components, but they're worth the money: you're guaranteed to appreciate their performance every time you switch your PC on. In this piece, we've looked at the various monitors and graphics cards available to help you find some of the best deals. Follow our advice, and in no time at all, your computer is going to look better than ever!

Graphics Cards: What To Look For

Graphics cards are essentially separate processors that sit inside your system handling nothing but the graphics output. The GPUs on graphics cards are able to perform the complex calculations required to create certain effects and 3D geometry that would otherwise be running on your CPU in addition to everything else. If you're a gamer, the leap in performance offered by even a basic graphics card makes them instantly worth buying. And if you're not a gamer, you'll still see performance benefits (though admittedly not as keenly).

Like processors, graphics cards are divided into two main camps: AMD (which produces the Radeon line) and Nvidia (which produces the GeForce line). Unlike CPUs, there's no clear division between the two manufacturers. Nvidia cards tend to be a little more expensive and faster, but also run hotter. Radeons are more efficient and better value. But those are only general rules; it could equally be the other way around, depending on the model.

Graphics card architecture means there's rarely any point buying anything other than something from the latest generation or two of cards, because they're usually less expensive, better value and better-performing than any of their predecessors. Currently, that means buying either a Radeon R7 200 or R9 300, or GeForce 700 or 900-series card. The first 10-series GeForce cards, following the 900-series, are available but they've only just been released and are still prohibitively expensive, so we wouldn't recommend those just yet!

A quirk of the graphics card industry is that rather than making the cards themselves, AMD and Nvidia produce 'reference' designs, which are then copied by manufacturers (such as MSI and Gigabyte). Individual manufacturers can modify the reference designs, leading to slight differences in performance and feature sets even between cards of the same model number.

Within lines it's easy to tell which cards are good and bad, because the higher the card's model number, the better it is. Clock speed and RAM quantities are worth looking at if you want to compare two similar-looking cards, but it's only much help if they're already the same model.

Radeon Deals
Budget:
Sapphire Radeon R7 250 (£70)
It's priced well and based on fairly recent architecture from 2014, so you could be forgiven for wondering what's wrong with the Radeon R7 250 to make it so cheap. And really, there's nothing. It's economical on power, drawing all that it needs from the PCI bus, and it can shut down unused cores to save power when not in use. It's also faster than its closest Nvidia equivalents, which is mostly the case at the low end of the market. 1GB of RAM is maybe a little low, but we'd say that's only going to be a problem for the kind of high-end gaming you wouldn't do on a £70 graphics card anyway. Crucially, this card is substantially better than most of Intel and AMD's on-board GPUs, which means it's definitely worth buying even if you're looking to run a budget gaming system. Go any cheaper and you'll see very little improvement. Indeed, it's actually worse than the Iris Pro 6200 GPU found on Skylake Core i7s!

Mid Range:
Asus STRIX R9 380 (£154)
The R9 380 is about a year old at this point, and that's pushed its price down, so it has a great

Sapphire Radeon R7 250

Asus STRIX R9 380

XFX Radeon R9 Fury 4GB

balance of affordability and newness. This is the 2GB version of the card (which again, is going to be adequate for all but the most ridiculously high-end demands), but a 4GB version is available. Unlike the R7 250 (and like other cards at this level), it's a double-height card, so compact and mini-ATX systems may not have the necessary room to accommodate it.

As for why you should specifically choose the Asus Strix line for this card over the others, we're attracted by its low noise levels. The company boasts that the DirectCU cooler has a 0db fan, so you can play in complete silence at low-loads, and that even at high loads the card runs 20% cooler and three times quieter than the reference design. Hard not to be attracted by that, really.

High End:
XFX Radeon R9 Fury 4GB (£350)
At £350, the R9 Fury from XFX is a good £50 cheaper than some of the others in its range, but the brand is strong and the card tests reliably, so we think that the saving more than offsets the extra speed some of the

bigger brands offer. It's capable of 6K resolutions with 4GB of high-bandwidth memory, and it can process VR environments without lagging or tearing, thanks to LiquidVR technology. Power-wise it's a pretty hungry piece of hardware: you'll need a good 750W PSU to keep it going, but on a high-end system that's the kind of requirement you have to live with.

For reference, XFX clocks its card at 1000MHz, while Gigabyte's factory-overclocked version is a whole 1% faster, at 1010MHz. Admittedly it has a slightly better cooler, so if you're into overclocking, it could be worth it, but if you're just happy to have a fast card and don't want to push it any harder, we're confident that this card is the better deal.

GeForce Deals
Budget:
EVGA GeForce GT 740 Superclocked (£74)
The GeForce GT 740 is about as slow a graphics card as you'd want to put in even a budget system, assuming you're building it new. Again, it doesn't quite trump Intel's Iris Pro 6200 GPU, but it's much faster than

basically any other integrated chip around. The price difference between this card and the Radeon R7 250 is negligible, but if you're looking for a good deal, the GT 740 is slightly better – not least because it has 2GB of RAM even at this price.

EVGA's version further improves the card, with an overclocked GPU running slightly faster than the reference design. Although it's not technically double-height, it is still pretty chunky, so you might prefer a smaller card. Other than that, there's very little we can't recommend about it at this price. The extra GB of RAM makes it worth your time, and even if you're not a gamer, it supports video up to 4K. As entry-level cards go, we'd be more than happy with it.

Mid Range:
Gigabyte GTX 960 OC 2GB (£160)
The GTX 960 is slightly less powerful than the Radeon R9 380 overall, so if you're choosing to buy one, it's worth going for an overclocked model like Gigabyte's. The double-height card features a custom WindForce dual-fan cooler and a 1216MHz clock speed, so it's

a formidable piece of gaming hardware – though almost the exact opposite of the quiet R9 380. Although it only has 2GB of RAM, like the GT 740 card we just looked at, it's worth pointing out that this is the faster and more efficient GDDR5 memory. You will need a 400W power supply, but on a mid-range system that's far from an unreasonable ask. Although it is double-height, it's worth pointing out that the card itself is fairly compact; it's shorter than many graphics cards and largely devoted to funnelling heat out of the way. This makes it especially good if you're trying to get some formidable gaming capabilities into an otherwise tight system. A solid all-rounder.

High-End:
MSI GTX 980 4GB (£415)
Frustratingly, if you want a high-end GeForce card, there's almost nothing between the £320 price (which isn't that much better than a GTX 960) and the £400-plus prices of the GTX 980. If you want a card that competes with the Radeon Fury X, this is where you have to go, and if you're already north of £400, the MSI GTX 980 is the one to

go for. It has 4GB of GDDR5 memory, VR-ready firmware and a powerful Armor 2X cooler. We're not sure the performance is worth £65 more than the Radeon equivalent, but in fairness that price is particularly low. Other Radeon Fury cards are much closer in their pricing to this card, so don't dismiss it purely on the basis of that. It's not that this deal is bad; it's that the XFX Fury is a particularly good one!

Monitors: What To Look For

Choosing the best monitor isn't just a matter of finding the biggest screen for the least money. It's also necessary to consider the other qualities it possesses, all of which contribute to the performance, cost and aesthetics of a new screen. Casual users may want to look for built-in technologies such as memory card slots, USB hubs and integrated speakers. Those using their PCs for multimedia purposes, such as watching TV or movies may prefer high brightness and contrast capabilities. Gamers will want low response times, while media professionals will look for good colour replication.

Everyone should look for a high resolution, which offers a sharper picture, and the minimum resolution for a modern system should be 1920 x 1080, which allows full HD video in a 1:1 ratio with the panel. If you're building a high-end system, 4K support is the order of the day, but don't be surprised if you have to pay through the nose for it.

Unlike most hardware lines, a high-priced monitor isn't necessarily the best or most suitable for everyone. The most important component of a monitor is its 'panel' – the technology that makes up the actual screen. There are two major types of LCD panel, both of which have their own advantages and disadvantages. TN panels are the cheapest and most common, but also

lowest quality (although they do have good response times), while IPS panels have the best colour replication and image fidelity, but are by far the most expensive. It's all relative, of course; there are good TN panels and bad IPS panels. The trick is finding the right compromise to make.

Monitor Deals
Budget:
Samsung S22D300HY (£90)

It's now possible to get a decent monitor for under £100, and while many of them are incredibly basic, the 21.5" Samsung S22D300HY has an HDMI port, meaning you can get a full package, 1080p monitor for an incredibly good price. As well as benefitting from Samsung's deserved reputation for high-quality screens, this monitor also has a tilt ability that allows you to adjust its orientation – something cheap screens often lack. Add to that a game mode, magic upscaling and an off timer, and it's clear that this isn't a no-frills package. Objectively. it's not fantastic (it's got a huge bezel and a TN panel), but at this price it feels like a purchase more than worth making.

Mid Range:
Dell U2515h (£255)
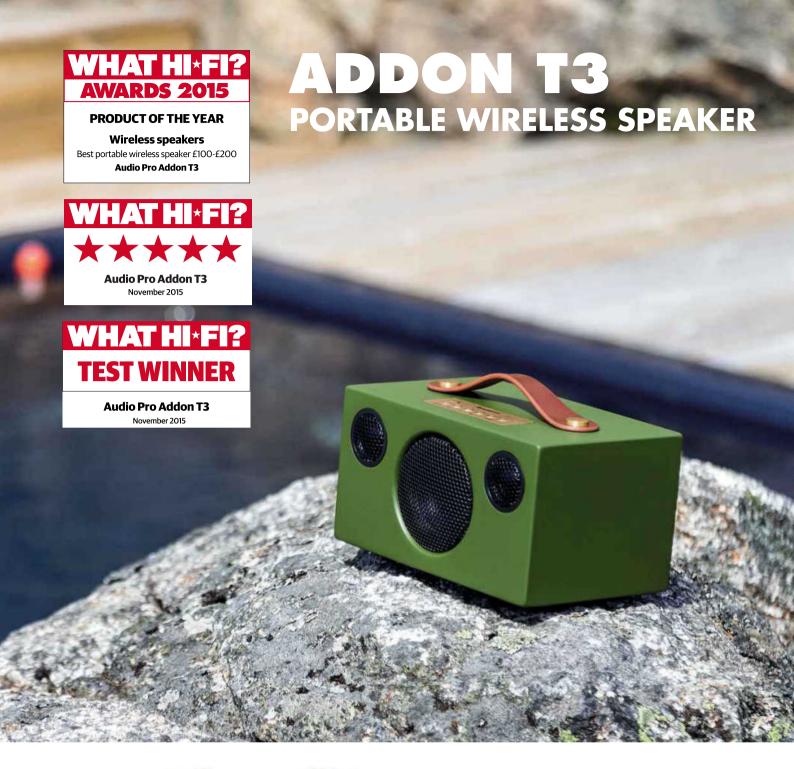
Dell's monitors are always high quality, and this ultrawide 25" IPS screen is a great all-rounder. With a 6ms response time, it's height-adjustable and wall-mountable, and it's got Dell's reliability and eco-efficiency enhancements that keep its performance strong. There's also a three-year limited hardware warranty and three-year advanced exchange service, so if anything does go wrong, there'll be a replacement with you shortly. In addition to dual HDMI, DisplayPort and mini-Displayport connections, it has a five-port USB hub, one of which can be used for charging, and the Quad HD resolution means your games and movies can look better than ever on it.

EVGA GeForce GT 740 Superclocked

Gigabyte GTX 960 OC 2GB

> 66 **Unlike most hardware lines, a high-priced monitor isn't necessarily the best** 99

MSI GTX 980 4GB

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Samsung S22D300HY

BenQ BL2711U

Dell U2515h

High-End:
BenQ BL2711U (£480)
Realistically, if you want the best screen around, it needs to be 27" and support 4K resolution, and that's hard to find at anything until £500. But it does exist, and the BenQ BL2711U is proof of that. As well as DVI, HDMI and DisplayPort inputs, it has built-in speakers, full 4K support, and colour and definition designed to meet the demands of high-fidelity professional applications. There are four USB 3.0 ports, a low blue-light mode for nighttime use and a fully adjustable stand. As monitors go, it's pretty much the last word in desktop computing – but for this price you'd expect nothing less. **mm**

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MEMORY AND STORAGE DEALS

Give your PC a quick and easy boost with these upgrades…

When building a system, it's a common mistake to overlook the memory and storage components in favour of faster processors and graphics cards. But you might be surprised to learn that slow memory and inadequate storage can cause significant bottlenecks, the likes of which no faster processors will be able to remedy. No matter how fast the data can be processed, it still has to be moved to a processor – from the storage, via the RAM.

Think of it as being a bit like a coal furnace on a train: a bigger furnace will burn faster, giving more speed, but eventually you reach a point where you can't burn coal any faster. What you need is someone to shovel coal quicker. This, roughly, illustrates the problem with many systems. Slow hard drives and small RAM capacities mean that the fastest processors are forced to idle while waiting for data to be transferred. And that's why we've come up with this selection of memory and storage recommendations for you to help speed up your system.

Memory:
What To Look For

No matter how much RAM you've got, it seems like a computer can always benefit from more. Of course, this isn't true. Around 8GB of memory should be sufficient to render any modern system capable throughout its lifespan, and 16GB will future-proof it for years to come. But there are still ways you can improve performance – not by buying more RAM, but by buying better RAM, and knowing how to tweak it for speed.

> **RAM speed is a combination of various factors, including latency, clock frequency and transfer rates**

Adding RAM is one of the better ways to give your computer a general performance boost. In some cases, a RAM upgrade might even lead to more tangible improvements than a new CPU, since the visible effects of additional RAM are most apparent when performing some of the most common tasks, such as web browsing and multi-tasking.

The RAM market can seem deceptively simple from the outside. On the surface, there's not much to select – capacity, brand and speed rating – but what else is there? We'll get to that in a moment. Buying RAM is easy, but buying good RAM or the right RAM? That's a challenge.

Cost-wise, it's important to recognise that the difference between cheap RAM and expensive RAM is largely down to quality control. High-end manufacturers add things like heatsinks or lights to distinguish their components for a different market, but unless you're into overclocking, there shouldn't be much difference once it's in the actual PC. Remember that it's advantageous to buy RAM in pairs rather than singles, where possible.

Singles are often cheaper, but two 4GB sticks of RAM will give faster performance than one 8GB stick.

Generally speaking, it's not a good idea to reuse RAM. Mixing and matching modules from old systems can lead to performance clashes. Unless you have a good reason for keeping hold of your existing memory modules, it's not a terrible idea to simply replace them, rather than run slower/older modules alongside your new hardware. This will minimise any problems.

Overall, RAM speed is a combination of various factors, including latency, clock frequency and transfer rates. All you need to know when buying RAM is that latency timings are given as four numbers separated by hyphens, where lower numbers describe quicker communication between the RAM and the CPU. Clock frequencies are given as a more familiar megahertz value. As with

CPUs, higher is better. You can overclock RAM (if your motherboard allows), but as with CPUs, this can potentially damage the hardware.

RAM transfer rates are given in MB/s, using codes such as 'PC3-10666'. This, translated, tells you that the RAM is DDR3, capable of transferring data at a rate of 10,666 MB/s. Again, higher numbers here are better.

It's worth pointing out, too, that DDR4 RAM is starting to reach the consumer market. Intel's latest platforms support it, and AMD's Zen platform, due later this year, is expected to as well. These systems are still compatible with DDR3, and it's not impossible to find Skylake systems that require DDR3 memory, but generally speaking, if you have the option to use DDR4 you should.

Kingston ValueRAM 8GB DDR3

Crucial Ballistix Sport 8GB DDR3

Crucial 8GB DDR4`

DDR3 Deals
Budget: Kingston ValueRAM 8GB (2x4GB) DDR3 1333MHz (£26.50)
Low prices and reliable performance mean Kingston's ValueRAM is a smart choice for anyone building an entry-level system that isn't going to be taxed much during its life. Aimed at generic system-builders, it's plain, basic and priced to match. The only problem is that RAM prices are currently so low that the difference between this and more performance-oriented memory is very small. ValueRAM is aimed at bulk buyers, so it's only great value in situations where £2-£3 differences will stack up. Still, it is cheaper, and day-to-day performance will be more than adequate, even though it's 1333MHz.
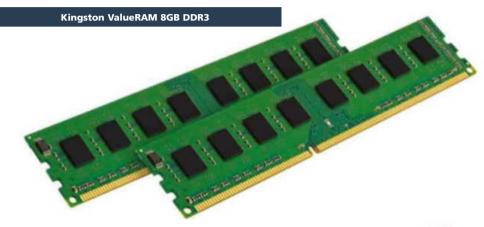
Premium: Crucial Ballistix Sport 8GB (2x4GB) DDR3 1600MHz (£31.50)
Although it doesn't look especially hardcore, Crucial's Ballistix Sport range is designed for committed enthusiasts. Although it features standard timings and voltages, its 1600MHz / PC3-12800 combination means it's far from the worst kit on the market. The standard package can be overclocked a little without any problems, thanks to the heat spreaders, but performance maniacs will find it hitting limits slightly earlier than more expensive RAM from the likes of Kingston and Corsair. The 2 x 4GB configuration allows it to take full advantage of its speed and means that any all-purpose system will be kept in free memory for as long as you need. At least where DDR3 systems are concerned, it's a much better value prospect than any overtly enthusiast RAM.
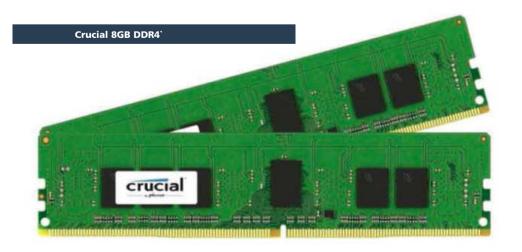
DDR4 Deals
Budget: Crucial 8GB (2x4GB) DDR4 2133MHz (£29)
Even the cheapest DDR4 kits on the market offer a considerable step up from the best DDR3 kits, which is why new system builds should look to incorporate the latest hardware as much as possible. Even at this basic level, DDR4 uses less power and has higher bandwidth (PC4-17000) than DDR3. This isn't the

absolute minimum you can spend on DDR4 modules, but you'll only find single DIMMs if you spend any less, and it's beneficial to buy a matched pair. Unlike DDR3, the price hike from this type of DDR4 RAM to some much better modules is more than a little tangible, so if you're not building a high-fidelity gaming PC, it's definitely worth considering Crucial's entry-level offerings.

Premium: HyperX Savage Black (2x4GB) DDR4 2400MHz (£51)

If you want a premium DDR4 kit for your system, HyperX's Savage Black should fit the bill. It has a low-latency design combined with gold-plated contacts to ensure clean and speedy communication between your memory and motherboard. Rated at 2400MHz, the extra speed is going to translate in obviously better performance where gaming systems are concerned, and the heat spreaders ensure that the modules aren't negatively affected by high temperature systems. If you're a gamer with a lot of hardware warming up your PC, it's worth paying extra for.

Storage:
What To Look For

Buying and installing storage is probably the easiest part of constructing a PC system, but you're still faced with a choice: do you want a mechanical-based HDD or a solid-state SSD?

The real question here is whether you favour capacity or speed. Both drive types have other advantages, but overwhelmingly the selling point of HDDs is that you can get literally thousands of gigabytes for an incredibly low cost, while the selling point of SSDs is that they're extremely fast and can speed up your computer – not just how quickly it boots, but also how fast data-heavy software like games run.

Overall, mechanical hard drives are cheap, reasonably fast, have substantially higher capacities than most storage methods and can remain functional for years without any significant errors. They remain a great choice for data storage, and whatever you want to use your
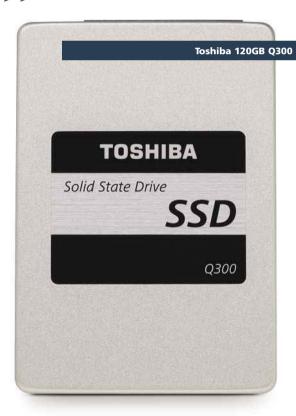
> ## " Solid-state drives are undoubtedly where you should be looking if you're building a new PC "

PC for, you can be certain that an internal hard drive will do any job you throw at it to reasonably high standards.

But solid-state drives are undoubtedly where you should be looking if you're building a new PC. The price of SSDs is falling fast, and while they're some way off competing with mechanical HDDs, they're good enough that you can run a system off one without paying a lot more. Compared to standard hard drives, SSDs have faster access times, make much less noise, run at a lower temperature and have lower power requirements, and that should be more than enough to make anyone with an eye on system quality consider them.

That said, it's important to consider the rest of your system. SSDs might not be the best choice if you're running a low-end CPU and don't plan to do any gaming, not just because of their cost but because you won't be able to see the full benefit of their faster transfer speeds. Similarly, while the amount of storage mechanical hard drives offer is incredibly tempting, they will cause bottlenecks on faster systems, especially as they age and the data becomes less organised.

Still, while we wouldn't say there's never a case for choosing a mechanical HDD over an SSD, if you only buy one, it should be an SSD, and if you can afford to buy two, get an SSD for your main drive and a mechanical hard drive for data storage.

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Seagate Barracuda 1TB

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SSD Deals
Budget: Toshiba 120GB Q300 (£34)

We wouldn't be comfortable recommending anyone choose a drive smaller than 120GB as their main one, so if you're looking to put an SSD in a budget system, we suggest you look at the Toshiba 120GB Q300. At £34 it's one of the cheapest 120GB units you'll find, and even though its overall read and write speeds are poor compared to most SSDs, it'll still trounce any mechanical drive you're using in every area except price. Time was you couldn't justify an SSD in a budget system, but with hardware like this on the market, it's a tough option to ignore.

Premium: Samsung 850 EVO 1TB (£250)

Samsung's SSDs have a deservedly high reputation across the board, so once you decide to go for a high-end drive, it makes sense to spend the extra money they cost. The 850 EVO series is as impressive as any of its consumer models are, but it's also got the chops to give enthusiast lines a run for their money, at least in terms of speed. The low price is slightly mitigated by the lack of adaptors and cabling (you'll have to provide the kit yourself), but in all other ways it's a purchase that justifies its high expense. If you're putting a gaming system together, we wouldn't want it to be running on anything worse, and especially if you're planning to install a lot of games, that 1TB of space will be particularly important.

HDD Deals
Budget: Seagate Barracuda 1TB (£43)

It's a bad idea to buy a hard drive cheaper than 1TB at retail, simply because the smaller the drive you buy, the greater the proportion of cost spent on materials and manufacturing becomes. Even 1TB drives aren't especially good value, but buying anything cheaper puts you in the territory of being actively mugged. 1TB provides enough capacity for both running a system or making long-term storage, so it's a good all-round purchase, which you can happily repurpose later on. You don't even have to skimp on speed: even the cheapest drives are SATA-3 (6GB/s) and run at 7200rpm, meaning a competitive experience. You can maybe save a few pounds by going with another manufacturer, but we'd argue that Seagate's reputation makes it worth the extra few quid.

Premium: Western Digital Blue 4TB (£115)

Mechanical drives currently go all the way up to 6TB, but you'll find the best pricing around 4TB, and that's more than enough space for all but the most committed data hoarders. In technical terms, there isn't a huge difference between this larger drive and any smaller ones you care to mention, because hard drive technology is broadly at its limits. Premium drives tend to just be larger, as in this case, or optimised for specialist purposes, which isn't much use to home users. Western Digital's new Blue range replaces the old Western Digital

Western Digital Blue 4TB

Green line of low-power, general-use read and write hardware, and between the drive's pedigree, price and capacity, there's no better choice around. **mm**
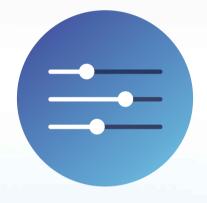
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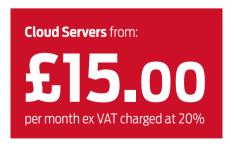
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HOW TO
GET THE BEST DEAL ON A NEW PC

Here are a few tips to ensure you don't pay too much...

I f you simply don't have the time or enthusiasm to build a new PC for yourself, there's absolutely nothing wrong with buying a pre-build instead. Indeed, while in the past it may have been cheaper to construct a system on your own time, and hunting around for the best deals on parts a way of saving serious amounts of cash, these days the price difference is often bordering on negligible. Indeed, in many cases, pre-builds can work out even cheaper than the parts inside them would be at retail, thanks to the bulk-rate discounts manufacturers can get. There's no doubt you surrender a fair amount of control over the components your system, but is it worth it for the amount of money you can save?

To help you get the best deal on a pre-build system, we've assembled our best hints and tips for buying full systems – everything from where to look to what to look for. Follow this advice and you'll end up with a PC you can be smug about – if not for what's in it, then for how much it cost!

1 Choose Your Retailer Carefully

One of the most important factors is the retailer you buy from in the first place. The market contains a wide spectrum of retailers, from high-street giants to indie enthusiasts. Generally speaking, chains are good at providing generic, low-priced systems, while indie stores are better at custom-building machines that are highly specialised, even task-specific, but slightly more expensive overall. You might get a free printer and copy of Microsoft Office by buying your system from PC World, but it's not going to offer you anything like high-end water-based cooling and a custom overclock like an independent retailer might.

The important thing is not to simply rush to the first name you find. Since most retailers have websites that allow you to custom-build a system, take your time and compare the prices. Try not to get distracted by 'extras' that you don't want – recycling centres are probably still littered with unused flatbed scanners that were provided 'free'.

2 Balance Your Components

Properly balancing your budget is essential to getting a good deal, and knowing what components to look for can be the difference between your money getting you an average PC or a fantastic one – or the difference between getting an okay deal and a great one. It's hard to be exhaustive given the number of options available, but there are a few simple rules to follow.

First: prioritise RAM. Pre-builds very rarely have a lot of RAM in them, mostly because it's easy to upsell. The fact is that more RAM is always worth having (up to a certain point – say 16GB) because it's cheap to add and offers performance increases in almost all aspects of a PC's operation. Unless you're aiming for a truly stripped-back budget PC, you'll want at least 4GB, but 8GB will ensure you're never at a loss for memory.

Similarly, you might be able to save a lot of money by going for a slower CPU. Contrary to what you might expect, slowing down the CPU won't affect non-gaming, non-

specialist systems too much, so it might be worth the saving. Indeed, if you're looking to save money then stepping down from Intel to AMD can save you a fair amount without having a huge impact on casual applications, such as browsing and office work.

Similarly, if you're buying an Intel system, a Core i7 is only worth considering if you're running software that can take advantage of its hyper-threading (hint: if you don't know you are, you're not.) so buying a Core i5 instead will result in a substantially better value system.

3 Skip The Extended Warranty!

Maybe it goes without saying, but extended warranties on PCs are a terrible idea for various reasons, even more so than on any other consumer electronics. Where most extended warranties simply end up outpricing the cost of a replacement over their full lifespan, an extended warranty on a PC practically accelerates their decline. Warranties prevent you from opening up your system and tinkering

with the hardware in any way, whether adding or removing – and a PC that you can't upgrade might as well be actively rusting.

Assuming you get a free 12 month warranty with your purchase (which is more or less standard at this point) it's worth waiting out the first six months or so before cracking open the case, just in case any hardware is faulty and needs to get some wear in before it breaks down. After that point, you can more or less do what you like. The chances of a fault that'll require you to replace your entire PC are miniscule, and mostly related to freak events like fires or lightning strikes. New computers almost never explode on their own!

The real kicker is that even if you were to take advantage of a replacement under warranty, most retailers will simply restore the PC to its factory condition. This means you'll lose anything you had stored on it anyway. If that's an option you want to pursue, you can do it at home without any great difficulty, and if you want to actually recover your data there'll be countless local shops and retailers who can help you out for a reasonable price.

4 Keep Your System's Purpose In Mind

Before you make any decision about a system, ask yourself: what is it you want this computer to do, and how will your decision affect that? It's understandable that you might want to make sure your new PC is a cutting edge machine with the best hardware but, unless you're looking for a specialist gaming or entertainment machine, a lot of the hardware you'll be introduced to is simply unnecessary. For example, things like separate graphics and sound cards are the domain of gaming and home theatre PCs only, while 3D monitors are next to useless in almost all circumstances.

Again, the good thing about desktop systems is that you've always got the chance to upgrade them later, so it always makes sense to start them as stripped down as possible. Adding new components is easy. Getting back money you've spent erroneously isn't. For example, buying a 3D monitor because you *may* want to watch 3D movies at

some point in the future will prove a false economy: by the time that happens, it's likely that the 3D monitor you could've bought will have dropped in price anyway! It's worth asking these questions about every component – at this point, even optical drives might be unnecessary additions to a new PC!

5 Time It Right

A big part of getting the best deal on a system is timing your purchase to take advantage of market trends. Prices tend to drop significantly after the announcements of new hardware generations, because retailers are keen to sell through their existing stock before it becomes obsolete. Likewise, there are usually big sales over Christmas/New Year and over the Back to School period, so if you can wait a month or two to take advantage of those, it's a good idea to do so. With a little patience, you could save yourself a couple of hundred pounds without having to do any extra work.

There's a risk involved, of course – manufacturers tend to keep release dates close to their chest in order to prevent this kind of behaviour damaging their retail partners, and even planned retail dates can go off course. Don't base your purchasing decisions entirely around upgrades!

6 Cannibalise Your Old System

Assuming you're buying a system to replace an existing one, you can save tonnes of money by stripping parts out of your old system. There are some things it's always good to replace periodically – power supplies and hard drives, for example – but if you're buying a new system it's unlikely that optical drive technology will have moved on substantially since you last bought a computer.

Even if you don't want to open your computer and get your hands dirty, it's worth remembering that there are plenty of peripherals that you don't have to buy new, but which will work fine with a new system. Printers, speakers, and even monitors can be upgraded separately when the time is right so, if you want to make your system cost as little as possible, you can throw their replacements out of your basket and reap the savings. **mm**

WHICH EXTERNAL HARD DRIVES ARE THE BEST VALUE?

Because more storage never goes amiss

Choosing an external drive can be tough at the best of times, but when there are so many on the market it's tough to know if you're getting the best deal. The price of storage is in constant flux, so how can you get the best deal on a new external hard drive?

To see which external drives are the best value, we looked at every available tier of storage and calculated which gave the most capacity for the lowest cost. Within each storage tier we automatically picked the cheapest drive as well, so our work can also function as a benchmark for storage prices – if you're thinking of buying a new external drive and it seems wildly more expensive than the ones presented here, check whether you're actually getting anything worth paying extra for.

Verbatim 320GB (£25)
Value: £1 = 12.8GB
This drive certainly has plenty going for it: it's extremely competitively priced, it has a fast USB 3.0 connection and it comes with a suite of Nero software for backup and cloning purposes. Its 'green button' technology means you can power it up or down manually, or set it to automatically suspend after a period of inactivity. It also doesn't require you to supply any additional power for it to work, taking all it needs from the USB interface.

The only down side is that, as with all low-price drives, it's not a great deal. If this isn't the cheapest external drive on the market right now, it's certainly not far off. However, that price is offset by the fact that there are corners cut in terms of storage – the cheapest part of the drive's cost – to bring it to you. 320GB isn't a paltry amount, but 12.8GB for every pound you spend can be considerably bettered.

Buffalo MiniStation Air 500GB (£35)
Value: £1 = 14.3GB
As well as being one of the cheaper 500GB devices around, the Buffalo MiniStation Air adds a whole load of extra features – most usefully support for smart devices, like tablets and phones. Wi-fi compatibility means it connects directly to your network, so you can make use of its storage from virtually
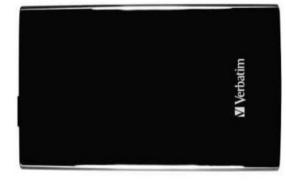
any device both on your home network and, optionally, anywhere else on the Internet.

You can still use it as direct storage connected to your PC through a USB port and powered from the same. It does have a built-in battery for portable use (for up to four hours) and can be charged from a separate power adaptor (included) or the USB port.

Again, though – fairly low capacity means it's not great value in terms of how much storage you get, but at least the extra connectivity features make it worth considering if capacity isn't your primary interest.

Intenso 1TB (£40)
Value: £1 = 25GB
Once you hit the 1TB class of drives, the value of the hardware surges dramatically. This 1TB drive is as cheap as they come but there are similar products from Buffalo, Samsung and Toshiba within a few pounds of Intenso's version. Here, the amount of storage you get for £1 almost doubles over drives with half the capacity, so instantly if you can afford to pay the £5-£15 more, it's worth doing so.

Admittedly, these drives aren't exactly overcrowded with features. USB-powered, USB 3.0 compatible, and contained within a sturdy and compact (if nondescript) case. There's nothing here to actively dislike considering the value it offers, but it is definitely a value product aimed at basic

Verbatim 320GB

Buffalo MiniStation Air

users. Still, triple the storage space of the Verbatim 320GB drive while costing only 50% more? That's a good deal however you slice it.

Samsung D3 2TB (£59)
Value: £1 = 33.9GB
An upgraded and expanded version of Samsung's incredibly popular 1TB M3 model of external hard drive, the D3 is the cheapest 2TB drive on the market at the moment, and drives of this capacity are even better value than 1TB drives. Any basic 2TB drive is going to get you well over 30GB for every pound you spend, and the D3 offers almost 34GB!

Unlike some of the cheaper USB drives, the D3 contains a full-size hard disk meaning access speeds are faster, but it does mean that it requires an external power supply to operate. It does still have a USB 3.0 interface and you get several software packages included for backups and encryption. As a full size unit it's a little larger and slightly noiser than some external drives, but broadly speaking that shouldn't cause any trouble if you're running it attached to a desktop. It's also compatible with consoles, routers, and other USB-capable storage devices.

Buffalo Velocity DriveStation 3TB (£70)
Value: £1 = 42.9GB
At one point it was 2TB drives where the best value hardware could be found, but that's gradually changed to the point where 3TB drives are now the sweet spot. If maximising the amount of storage you get for your money is what you're most concerned about – and where external storage devices are concerned that probably is the primary concern for a lot of buyers – then this is the sort of drive you need to aim for.

The Buffalo Velocity DriveStation specifically is the best-priced 3TB drive we could find, and it's got all the frills you'd expect of high-

Intenso 1TB

Samsung D3 2TB

Buffalo Velocity DriveStation 3TB

Seagate Backup Plus 4TB

end storage hardware. USB 3.0 interface and external power supply (unavoidable at this price) are expected, but you also get TurboPC EX data copy utility, automatic (though optional) 256-bit hardware encryption, access password management and an eco-power management tool.

Essentially, unless you have specialist needs for your storage or are operating on a very tight budget, there's no reason not to go for a 3TB drive around this price, even if it's not specifically this model. 3TB is what you should aim for right now, and that's unlikely to change for a while.

Seagate Backup Plus 4TB (£104)
Value: £1 = 38.1GB
Of course, if you need more than 3TB storage, that doesn't mean you're out of options. 4TB external hard drives exist, and while they don't really go higher in single-drive configurations they are still quite good value. The cheapest we found, the Seagate Backup Plus 4TB unit, still gave more than 38GB to the pound – better even than 2TB drives. That means if you want 4TB of storage, it makes more sense to buy one 4TB drive than a pair of 2TB drives.

Seagate's Backup Plus drive is a pretty complete package. As well as 4TB of storage, you get cloud-based mobile compatibility, backup software, social media integration through the Seagate Dashboard, a four foot USB 3.0 cable so you can place it out of the way (if you like) and a two-year limited warranty.

It is technically possible to get larger external drives than this, but mostly they're NAS-type enclosures or multi-drive units aimed at businesses rather than households. At the rate storage prices are dropping it won't be long before 4TB drives are the best value – but for now, they're only worth paying extra for if you'll truly need the space. **mm**

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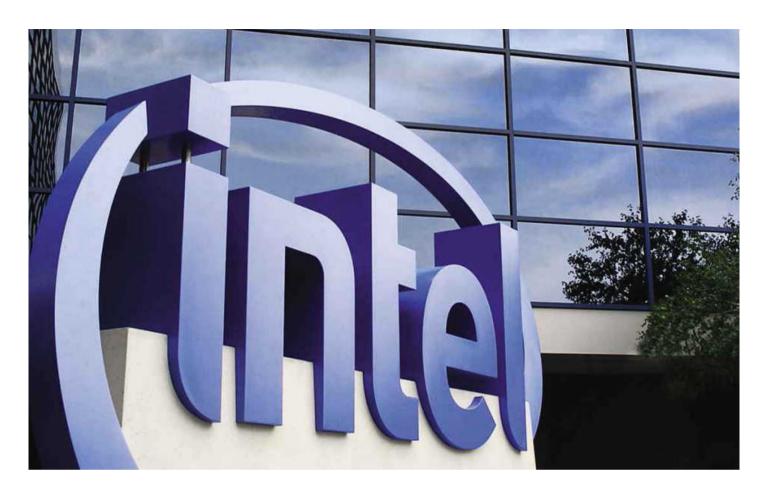
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Intel Exits The Mobile Market

Mark Pickavance analyses two significant announcements

from Intel and what it means for the chip giant

I f the PC industry has two champions, they're undoubtedly Intel and Microsoft. Like two childhood friends, they've formed the very backbone of PC development since the early 80s with their 'Wintel' alliance. Yet in recent years they've come under concurrent pressure, both in terms of sustaining their special relationship and in maintaining a market in which they're the most critical players.

Microsoft has had and continues to have problems with Windows, and now Intel is starting to feel the heat from shrinking PC sales. As a result, Intel has made two really significant announcements, one of which has wide reaching implications for the PC market and its long-time partner Microsoft.

Bad News

On 19th April, Intel released the sort of press release that those who work for it must dread. It opened well enough with, "Intel Corporation today announced a restructuring initiative to accelerate its evolution from a PC company to one that powers the cloud and billions of smart, connected computing devices."

Then, however, it took a nosedive with the news that the changes would "result in the reduction of up to 12,000 positions globally – approximately 11% of employees."

Ouch! It was hardly unexpected, however. At the same time as Intel employees were seeing the departure lounge signs flash on, the company reported first-quarter revenue of $13.7

billion. That places earnings for the first quarter at 42 cents per share – a decent amount below analysts' expectations of 48 cents per share. The workforce reductions are expected to net the company $1.4bn in savings by 2017, once it's taken a $1.2bn hit for 'redistributing' 12,000 people into the job market.

Chief executive Brian Krzanich outlined its future prospects in these terms: "These actions drive long-term change to further establish Intel as the leader for the smart, connected world. I am confident that we'll emerge as a more productive company with broader reach and sharper execution."

Reading between the lines, that seems more like: We've spent too long milking the PC cow; perhaps it's time to see what else we can grow on this farm. However, within just a few weeks, Intel would quantify the nature of this restructuring and end some strategic directions the company had previously promoted as being foundational to its future plans.

More Bad News
If the redundancies weren't bad enough news, Intel dropped another bombshell just weeks later that shook up many analysts in the mobile sector. In an interview that Krzanich gave to Patrick Moorhead at *Forbes*, he let slip that senior management at Intel had decided to terminate its SoFIA projects (specifically 3Gx, LTE, LTE2), as well as its Broxton SoC (Atom) for smartphones and tablets. Also, he revealed taht people working on those projects were being repurposed to work on Intel's 5G silicon and those profitable segments of the PC market Intel still relies on.

One can understand the enthusiasm to get ahead of the mobile curve with 5G, having missed the previous three mobile bandwagons, but the reaction to this news was an odd combination of shock and resignation. While Intel has made little or no progress in the mobile market, that it would walk away almost completely was unexpected.

The spin that Intel put on this radical departure was typically upbeat: "Intel is accelerating its transformation from a PC company to one that powers the cloud and billions of smart, connected computing devices …. We will intensify our investments to fuel the virtuous cycle of growth in the data center, IoT, memory and FPGA businesses and to drive more profitable mobile and PC businesses."

To close industry watchers, much of this wasn't completely unexpected, even if the exact timing surprised a few. After

▲ *Intel CEO Brian Krzanich, who in 2013 was outlining the company's long-term mobile strategy*

starting with much gusto in 2011, the smartphone side of Intel's business had yet to contribute positively to the balance sheet.

In 2013, it appeared as a $7bn loss – a result it equalled in 2014, before Intel chose to hide it in the client computing group numbers (which includes PC chips) in 2015.

Like previously failed Intel projects, like Itanium, it's unlikely to be candid about exactly what the total cost of its mobile adventure was. But with all the R&D it's done, fabrication facilities, marketing and 12,000 redundancies, we're probably talking at least $30bn or maybe a substantially bigger number.

That's a stark reminder that even the biggest companies with the smartest people can't always deliver what they hope to.

> ❝ **These changes will result in the reduction of up to 12,000 positions globally** ❞

Broken Promises
What really wrong-footed people was that just four years ago, the analysts had charted out how Intel would start small and end big in the smartphone market. In their crystal balls, the likes of Qualcomm, Texas Instruments and Nvidia would all concede chunks of market share to Intel's infinitely superior mobile products.

Looking back at many of these predictions, most assumed that Windows Phone would be a significant player by now. And that once established, like some sort of Mexican masked wrestling team, Microsoft would tag its partner, Intel, into the ring with an x86 phone chip and see off their nemesis ARM and its clever power management credentials.
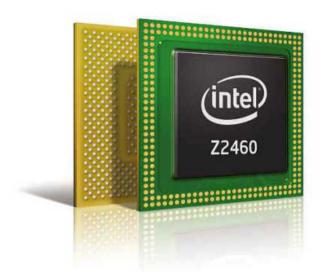
That was one horribly inaccurate hypothesis, as it turns out. Much of that theory was based on how Intel's Medfield chip was competitive in power at 32nm LP, so it would be even better when it moved to Intel's much vaunted 22nm 3D Tri–Gate technology.

And it was, but not enough to actually make phone makers flock to it and put it in actual phones or tablets. Each time Intes improved its technology and failed to make it stick, the analysts doubled-down, eventually identifying the 14nm fabrication as the potential eureka moment.

What this rather glossed over was that ARM has spent the best part of 30 years developing its power efficient technology, and 15 years ago Intel produced the Prescott P4, a chip that assumed infinite scope for PC power supplies to grow ever larger and cooling systems to reach air-conditioning proportions.

Since then, especially with the Atom, it's been more power conscious, but there's a huge difference between getting decent battery life out of a laptop and a phone and the expectations people have for those devices.

In 2012, this was the sort of thing that experts were saying: "Over a period of three years, Intel will start to take market share from Qualcomm, Texas Instruments and Nvidia, albeit very small in 2012. As Intel integrates wireless, moves to 14nm and waterfalls their offerings to lower price point smartphones, this makes much more competitive to handset makers and

▲ *This slide from an Intel internal roadmap has 'subject to change without notification' on it, and that's exactly what happened to the 2015 side of this plan*

carriers. I expect Huawei, ZTE or a major carrier to go big with Intel in 2013 which will make a huge difference."

The fine irony of those words is that they came from Patrick Moorhead, on his own blog – the same person to whom Brian Krzanich revealed that none of this would be happening, not this year, next or possibly ever.
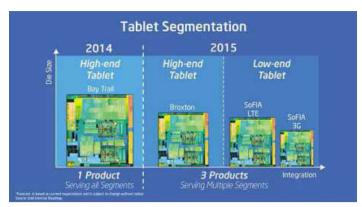
In Moorhead's defence, lots of people were thinking at the time that with Intel's resources and expertise, the mobile market was ripe for it to plunder. That oversimplified the business of making chips, downplayed the knowledge that ARM had accumulated and the natural resistance of a market already accustomed to a stable and honed technology.

This development leaves many in the prediction game wondering why they gave any credence to Intel's mobile ambitions, but it also puts Microsoft in a bit of a bind too.

Surface Phone

For those who don't follow the vagaries of the smartphone and tablet markets, Android dominates, Apple is shrinking, and both BlackBerry and Windows Phone's share are now so small they often doesn't make it onto pie charts. If they do, they're combined in the 'other' category.

Microsoft's failure in this sector has been spectacular, as it bought Nokia for the purpose of having its own phone maker, only to kill what little market share it had achieved up to that point.

According to multiple sources, Microsoft CEO Satya Nadella never wanted Nokia or Windows Phone, but felt compelled – probably because he's a board member and a major shareholder – to follow the path created by his predecessor, Steve Ballmer.

> 66 **One can understand its enthusiasm to get ahead of the mobile curve with 5G, having missed the previous three mobile bandwagons** 99

Those championing these devices have seen Microsoft release numerous cheap Windows Phones, fluff the release of Windows 10 onto the platform, and most recently launch two new flagship phones at totally non-competitive prices. With less than %0.5 market share, for practical purposes Windows Phone is dead and would be pushing up the daisies, had Microsoft not nailed it onto much of its marketing materials.

A very small group of determined people have stuck with it, some even buying the lacklustre Lumia 950 or 950XL. Many

SMART DEVICES - NEW PLATFORM ROADMAP

↑ Intel partnered on its SoFIA range with two companies that aren't likely to want to join it when it tries to join the 5G party further down the road

had hoped that at some point Microsoft would grace them with the much rumoured, but never official, Surface Phone.

The non-appearance of this legendary device has been explained by the lack of a sufficiently powerful Intel processor to drive it, because this device would go to the very heart of Microsoft's Continuum strategy.

Continuum, simply put, is where your smartphone becomes a PC, plugging into a full-size monitor, keyboard and mouse and running the apps you'd expect on a desktop system. Microsoft has taken two approaches to making this possible, the first being the universal apps that adorn Windows 10 in full-screen mode. Sadly, very few people use these, mostly because they're inferior to real Win32 apps, but also because the selection available is poor.

The second path was to have a phone that used an x86 processor, effectively a scaled-down Atom, which could run any app that works on a Windows 10 PC, solving the acceptance problem with Universal Apps.

With the death of the Broxton SoC, that dream went up in flames, because there won't be an x86-compliant mobile processor for the Surface Phone to use. Frankly, even if Broxton had progressed, the Surface Phone wasn't guaranteed, but it's now almost impossible to believe that it will ever see the light of day. In one fell swoop, Intel might have ended as Microsoft's mobile ambitions as well as its own.

It's interesting to note that having stopped making any Surface tablets with ARM processors in them and probably having let some people with that expertise leave the company because of that, Microsoft is left only with ARM on its future phones. Not that many people are expecting a wave of new Lumia devices any time soon. Indeed, many expect Microsoft to quietly leave the phone market entirely in the coming year.

Another product that is affected, if it exists, is the Surface 4 tablet. The current Surface Pro 4 and Surface Book are high-end devices with high prices to match. What's missing from this line-up is a replacement for the Surface 3, a Surface tablet that's eminently affordable.

If Microsoft wants to release this, it has few options, because Broxton is obviously off the menu. It could use an Apollo Lake, Core-M or mobile Pentium processor. Or it could just not make an affordable Surface.

Seeing as Microsoft has a hardware announcement coming up soon, I'm sure it won't be long until we all know how that decision went.

SoC Questions

When this story first broke, many people wrongly concluded that Intel was about to stop making Atom-class processors altogether. At this time, that seems very unlikely, because

↑ The Asus Zen Phone 2 was one of the very few high-profile branded devices that used an Intel processor. The top model uses a quad-core Intel Atom Z3580 running at 2.3 GHz, but it hasn't been a huge seller

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Head of Intel's mobile chip division, Aicha Evans tended her resignation last month, only to retract it after her boss, Brian Krzanich, convinced her to stay. Intel recently lost both Doug Davis, its Internet of Things business expert, and Kirk Skaugen, head of the massive client computing group, in quick succession, so keeping Evans is important if Intel is to make its future focus on 5G remotely credible

The left side of this Intel graphic happened; the right side is cancelled

while Broxton is indeed toast, other parallel developments are continuing.

Intel's plan for its system-on-a-chip business had three performance levels corresponding to smartphone, tablet and notebook products. The first set of these appeared in 2011 under the Saltwell Atom Core codename and were 32nm chips. Two years later, Intel moved down to 22nm with the Silvermont collection, and last year to 14nm with the Airmont Atom core.

This year, it intended to stay at 14nm but incorporate some major architectural enhancements. These transitioned into the 'Goldmont' Atom core that included Broxton, Willow Trail and Apollo Lake chips. With these announcements, Broxton and Willow Trail won't be appearing, leaving Apollo Lake as the only survivor of the Goldmont project.

In addition, the loss of SoFIA 3GX, LTE and LTE2 has other ramifications, because Intel partnered with RockChip and Spreadtrum on these, which both clearly have a large investment tied up in them.

Another problem is that originally Apollo Lake was destined specifically for notebook designs and not tablets. Since the removal of Broxton (and by definition Willow Trail, which was based on it), Intel has said that it will be offering this chip to tablet makers as an alternative.

This does seem slightly like what happened with Medfield and Clover Trail+ chips, which were presented to the smartphone market, even though they'd been designed for notebooks and were then unsurprisingly rejected by phone makers.

If Apollo Lake isn't suitable for tablets, then ARM will have the phone and tablet market entirely to itself, with Intel relegated to notebooks, laptops and desktop computers mostly running Windows.

What's worrying some is that no new roadmaps have appeared from Intel outlining what happens beyond Goldmont, even if most analysts are quietly confident that Intel will keep making Atoms beyond 2016. What information is sadly missing to help us better understand Intel is the profitability of Atom overall and how that compares with the money per wafer it makes from its Core range or SDD products.

> ❝ **If Apollo Lake isn't suitable for tablets, then ARM will have the entire phone and tablet market entirely to itself** ❞

Final Thoughts

Whenever Intel hit an obstruction it wasn't expecting, it typically engineers its way around it. Regrettably, that methodology may not be enough to address its current list of predicaments this time.

It's effectively seen off AMD as any sort of serious threat in the desktop market, but the spoils in this conflict now appear to be tainted by the decline in the PC market space. Being the dominant player in a shrinking market is never a great place to be, however profitable it might be right now.

But shrinking PC sales are just the visible bit of this iceberg, because they're symptomatic of some significant directions that personal computing technology is now heading in. The first of these is the sway of consumer

Intel's Atom SoC Platforms (Red Is Dead)					
Atom Core	Fab	Smartphone	Tablet	Notebook	Year
Saltwell	32 nm	Medfield Clover Trail+	Clover Trail	Cedar Trail	2011
Silvermont	22 nm	Merrifield Moorefield	Bay Trail-T	Bay Trail-M/D	2013
Airmont	14 nm	'Riverton'	Cherry Trail-T	Braswell	2015
Goldmont	14 nm	Broxton	Willow Trail	Apollo Lake	2016
			Apollo Lake		

Intel's mobile device ambitions started with such confidence and ambition, but ended with almost no market penetration whatsoever

products that ARM has very effectively managed, where people just don't care what OS they run, as long as it's pretty. What the makers of these devices like are off-the-shelf parts that they can bolt together and use to deliver tons of functionality quickly and cost effectively.

That's not Intel's game, as it's prided itself on getting customers to part with very large sums for cherry-picked processors and its bespoke support chippery. Those days could well be numbered, because the whole tick-tock release schedule and a new socket every two years has worn pretty thin with most PC owners and makers.

That's the symptom of another issue confronting it: the amazing power of modern PCs. The era when Microsoft released a new Windows version and we all bought a new PC to run the new feature set is long behind us. Even a very modest PC is extremely quick these days, especially if you throw an SSD in it, and very few applications make any Core series system break sweat.

That situation isn't likely to get any better, because game writers, for example, are more interested in the GPU resources available and not the CPU these days. The advent of DX12, should it ever become widely used, is further bad news, because it allows the GPU to be more fully exploited even on a system with a modest processor.

These are all things that Intel doesn't really want to hear, having spent the best part of 35 years building its company around priming a more-hertz-are-better system, only to see it become sidelined by the smartphone, tablet and Raspberry Pi.

If it's hoping that the extra demands made by VR are riding to its rescue, it might want to rethink that strategy, at least in the medium term. The company line that it will be focusing on 'the cloud' is the same one that every tech business with a future success problem seems to spout. Microsoft is doing the

same, and it has all the hallmarks of a street illusionist relying on misdirection to wow onlookers.

Business conducted in the cloud is rather invisible to all but those tasked with providing the facilities, and the buying public doesn't really care if their photos are on a server owned by Amazon powered by a processor made by Intel. Accordingly, I can't see Google, Microsoft or Amazon allowing it to paint huge 'Intel Inside' graphics on the outer walls of its data centres.

And the final pachyderm in this room is Intel's reputation for creating power efficient designs which, with the Broxton cancellation, appears to be in tatters.

The future of cloud computing won't be x86 compatible, and it isn't the return of the Itanium, its millions of tiny super-power efficient cores working to solve huge problems by sheer force of numbers. Those aren't the chips that Intel is currently making, and its foray into this sector has now ended in abject failure.

Everything about the development of the Atom into a processor suitable for phones and tablets always had that me-too whiff about it, and those companies wrestling with the disturbingly small margins that phones bring just didn't buy into it.

When it exited the market, Intel was probably at least three or more years away from having a credible phone chip, and that was money that it just wasn't prepared to burn in the hope that it would dent ARM eventually.

However you dress this up, Intel as a company needs to accept that it's going to have a much smaller profile publicly and probably a significantly smaller operation with fewer staff. This is the only viable way it can maintain its profitability while keeping its stockholders happy, as the PC business continues to shrink.

It may well be that the 12,000 people heading out of the door are just the first shoe dropping. Another, sadly, can't be far behind. **mm**

Step By Step: Make You Own ZX Spectrum Loading Screen

David Hayward makes modern loading screens the old-fashioned way

You have to admit there was something quirkily endearing about the loading screens on the ZX Spectrum. In some ways they were almost as popular as the games themselves, and in some instances they were considerably better than the games that were eventually loaded.

A lot of loading screens weren't all that good, but throughout the vast catalogue of Spectrum titles, there were some absolute amazing works of pixel art. Remember *Uridium*, *3D Star Strike*, *Treasure Island Dizzy* and even *The Hobbit*? There were also some that allowed you to play a game like *Space Invaders or Pac-Man* while the game loaded in the background. Ingenious stuff.

Anyway, what would you say to making your own Spectrum loading screen from any image you already have? And you'll be able to load it onto a Spectrum emulator or even the original hardware if you have right kit. Intrigued? Then read on.

Step 1
The first thing you'll need is an image to convert into a Spectrum loading screen. For our example we're going to use a JPG of a Micro Mart cover from the April special a few weeks ago.

You'll also need at this stage a copy of BMP2SCR, which can be found at **goo. gl/7cdc55**. This is a small zipped file, which when downloaded will need the BMP2SCR_ EXP_2.11a executable extracted and saved into the same folder as the image you're planning on using.

Step 2
Double-click the BMP2SCR executable, and from the pop-up Explorer window, choose the image you want to convert into a loading screen.

Step 3
You'll notice that the image is only displaying a small portion in the preview screens along the top of the BMP2SCR program. To remedy this, click on the Processing tab and click the

radio button next to the 'Automatic resize' option in the Resize section.

Step 4
Click on the 'ZX Conv. Modes' tab, and from the first column, SCR Modes, choose either Colour solid, Colour OrdDith or Colour Tritone, depending on which you think looks best. There are also black and white options available, so by all means have a browse through them all.

Step 5
Once you're happy with how the image will look when loaded on a Spectrum, click on the Options tab and make sure that in the Save Format box the 'Standard raw (SCR, MLT…)' option is selected.

Name the new image file in the Filename and Spectrum/SAM text boxes at the bottom of the screen, and finally click the Save Now button just above those options.

Step 6
You can now close down BMP2SCR, and provided all went well, you'll have a filename. SCR file in the same folder. Windows will think it's a screensaver file.

Next, you'll need a copy of Pasmo, a Z80 cross assembler for converting files into a readable format for the Spectrum. You can get it from **goo.gl/wFkyzB**.

Step 7
Download Pasmo to the same folder as your image and extract the contents, making sure that the filename.SCR file is in the same folder as the Pasmo executable.

You'll now need to create a file called LoadingScreen.asm in the same folder as Pasmo and the image you've already converted. To do this, enter the Command Prompt (Windows key + R > CMD > Enter) and from the folder where Pasmo and the file exist, enter:

    Copy NUL LoadingScreen.asm

Press Enter, and this will create the file.

Step 8
From within Windows Explorer, right-click on the LoadingScreen.asm file and choose Edit from the menu to open it in Notepad.

In LoadingScreen.asm, enter the following lines:

    org 0
    incbin "filename.SCR"

Replace filename.SCR with the name of your converted image file. Save and exit Notepad.

Step 9
Drop back into the Command Prompt and from the same folder as Pasmo and the other files, enter:
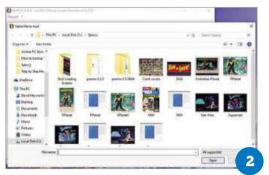
    pasmo --tap --name IMG LoadingScreen.
    asm NewFileName.TAP LS.TXT

This command will run the LoadingScreen.asm file through the compiler, converting the filename.SCR that we defined in LoadingScreen.asm into a

new file called NewFileName.TAP. Obviously you can rename the NewFileName.TAP to whatever you like, as long as it ends in .TAP. Note as well the double hyphen before the tap and name syntaxes.

Also, you can change the --name IMG section to another name too, provided it's less than eight characters in length.

Step 10

The newly created .TAP is what we'll use to load into a Spectrum emulator. For our example we're using Spectaculator, but you can use any emulator that allows you to load up the TAP as a virtual tape image.

With you Spectrum emulator loaded up, choose the 128 BASIC or just the standard 48K BASIC and enter:

LOAD "" SCREEN$

You can just type this into 128K BASIC, but on a 48K Spectrum you'll need to press the following keys:

J right-Shift P right-Shift P right-Shift left-Shift right-Shift K

It's a bit of a chore on a modern keyboard, which is why we usually stick to 128K BASIC modes. Note: you'll need to use the SCREEN$ command or it won't load correctly.

Bytes: SCREEN

With luck, your converted image should load up as a traditional ZX Spectrum loading screen.

To change the image, all you need to do is alter the LoadingScreen.asm files incbin statement to match the SCR file name.

Now you can go forth and convert all those wedding pictures to load up on the Spectrum.

Original Hardware

Getting your newly created loading screen onto the original hardware is remarkably simple. All you need to do is save the TAP file to your phone or tablet or on your network

somewhere, then install PlayZX from the Google Play store.

Load up PlayZX, and from the Local tab locate your loading screen TAP file. Plug in the cable from the phone or tablet's headphone socket to the EAR port on the Spectrum and enter the LOAD" "SCREEN$ command again, while pressing Play in PlayZX on the phone. **mm**

Alphabet Pi: K

David Briddock meanders through
Raspberry Pi technology from A to Z

THIS WEEK: Kernel, Kano and keyboard

Kernel

Unix and Linux operating systems have a low-level software layer called the kernel. The kernel is responsible for managing input and output requests from file, disk, network and other devices. It translates them into data processing instructions via the computer's central processing unit (CPU) and memory storage.

The kernel layer sits below the suite of application software we normally interact with, such as terminal shells, user interfaces, utilities and development tools, and it runs in a protected area of memory for robustness and security.

The Linux kernel was created in 1991 in Finland by Linus Torvalds, initially for purely personal reasons. Since that time, and thanks to its open-source licensing, his little project has attracted thousands of individual developers and organisations who've enhanced and improved the original Linux kernel.

> ❝ **The Linux kernel was created in 1991 in Finland by Linus Torvalds** ❞

Kernel software developers write their code using the Linux Kernel application programming interface. The Linux kernel itself is released under the GNU General Public Licence (**gnu.org/licenses**) to ensure that others can offer their own contributions and create their own flavours of Linux. Today there are scores of Linux-based operating systems, which includes Debian Linux, the foundation of the Raspbian distribution.

Kano

Giving a Raspberry Pi as a birthday or Christmas gift is a great idea. However, you will need to purchase a few other accessories: an SD card, keyboard, mouse, cables and so on.

A company called Kano recognised this might be a problem for some parents and devised a complete, all-in-one computing kit based around the Raspberry Pi board (**uk.kano.me/products/kano-kit**). Inside the neatly arranged box you'll find a protective case, orange keyboard with built-in trackpad, SD memory card, USB wi-fi dongle, loudspeaker and cables, plus fully illustrated construction and project books.

The whole process feels more like putting together a Lego kit rather than building a computer experimentation system.

▲ *Kano kit*

Everything is easy to assemble and brightly coloured, and the included Kano books have a pictorial storybook format. In fact, on its website, Kano suggests it's suitable for children as young as six.

Kano also supplies a number of other Pi-centric products. There's a screen kit that adds a TFT display to the Pi, a programmable lightboard with 126 LED lights and a Kano Club magazine subscription with stories, puzzles, hands-on projects and tips.
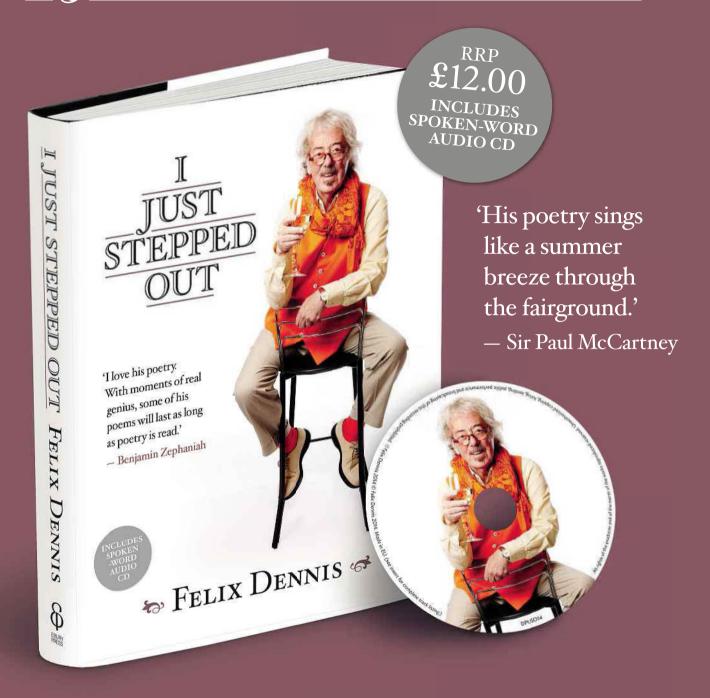
Keyboard

You can attach just about any USB keyboard to a Raspberry Pi. The one you already use for your Windows or Linux PC should work just fine, but with millions of Pi owners to satisfy, there are a growing range of dedicated Pi keyboards.

ModMyPi has quite a few options on its website (**goo.gl/hbLo3u**), as does the Adafruit site (**adafruit.com/categories/386**). Many of these are considerably smaller than a full-sized keyboard and therefore a better match to the Pi's credit-card-sized board. Others offer an integrated trackpad, which means you don't have to bother with a mouse.

If you're not keen on cables, then a number of products offer wireless connectivity. Adafruit supplies a wireless keyboard and mouse kit combo (**adafruit.com/products/1738**), as well as a mini wireless keyboard complete with trackpad (**adafruit.com/products/922**).

I JUST STEPPED OUT

'His poetry sings like a summer breeze through the fairground.'
— Sir Paul McCartney

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Is This The End For Fake Reviews?

Not every online review can be trusted. Some companies write their own – or pay someone else to say nice things about them. The days of fake reviews may be numbered, though. Sarah Dobbs investigates

Online reviews can be incredibly useful, and reading them has become an indispensable part of shopping, no matter what you're buying: reviews of clothes can tell you if sizes tend to run big or small, reviews of washing machines can tell you if they're reliable or tend to make a lot of noise, reviews of cars can tell you how fuel efficient they tend to be, or whether the upholstery stains easily… You get the idea.

Before making any kind of purchase, it makes sense to check out the reviews of the item you're considering – or the company you're considering buying it from. Services, as well as goods, tend to be reviewed online, so if you need a plumber you can see whether the one you're considering has left a trail of unhappy customers behind them or not.

Unfortunately, you can't always trust what you read online. Unscrupulous types might take it upon themselves to write glowing reviews of themselves and their products, and you might never be able to tell the difference. There are even whole businesses based around writing fake positive reviews online, to help businesses boost their reputation under false pretences.

The good news is, it's not an issue we just have to shrug our shoulders and try to forget about. Recently, the Competition and Markets Authority (CMA) has started cracking down on companies who trade in writing fake reviews, and Amazon has begun taking action, too – but it might be a big job. Let's take a closer look at these fakes, where they come from, and what's being done about them…

Trust No-one

By their very nature, fake reviews are designed to look authentic, so it's tough to say for sure exactly how many fakes there might be out there. According to the CMA's recent report, though, approximately £23 billion of consumer spending every year is influenced by online reviews, and half of all UK adults use online reviews to help them make decisions about how to spend their money.

▲ The Competition and Markets Authority is leading the charge on getting rid of fake reviews

As if that weren't enough to tempt businesses into faking a couple of false positives, a study from Harvard Business School from a couple of years ago found that having better online reviews leads to a direct increase in profits. According to the researchers, bumping up their Yelp star ratings by one saw restaurants raking in up to 9% extra – not a margin to be sniffed at.

So where do these reviews come from? Going back to the CMA report, it turns out there are a few different ways for business owners to improve their online reputation. The first, most obvious way, is to get an employee to bash out a few five-star raves. Depending on the business, those reviews might be posted in a few different places: for hotels, restaurants, and other tourist attractions, TripAdvisor is the obvious target; tradespeople might opt for sites like CheckATrade or Yell.com; and for everything else, there's Amazon. If all you want is for there to be one or two glowing reviews of your product in the obvious places, getting an existing employee to post them is the easiest way to fake it.

Beyond that, though, it gets a bit more nefarious. The CMA found cases of

How To Spot A Fake Review

The whole point of fake reviews is to make it seem like they're just the enthusiastic opinions of genuine customers. Sometimes they're pretty believable, but at other times it can be relatively easy to spot that something's amiss. Here are some warning signs to look out for, before buying something on the word of an online review:

Too much detail
Genuine customers probably won't refer to things by their full model numbers. If it's a review of a new graphics card, then maybe the tech specs are relevant, but otherwise, reviews that include too much precise technical detail should raise a red flag.

Too little detail
While too much detail might mean the manufacturers are talking themselves up, too little detail could be a sign of someone writing a review without ever having actually seen the product in question. It's a tricky distinction, but it's also something that sometimes, you can just tell.

Too many reviews, too soon
If a new product has tons of reviews, especially if they were all posted in a short space of time, that could well indicate that the reviews have been bought and paid for.

Similar phrasing
If there are lots of very positive reviews that all seem to use the same few phrases, that could suggest they were all written by the same person – someone who's bashing out fake reviews for a living.

Too glowing
Maybe you're reading a review from someone who's just really excited by their new purchase, but be wary of anything with too much hyperbole. If the reviews seem to have been written by customers in raptures over their new washing machine or generic phone charger, something might be wrong.

Too negative
Again, it seems strange that being too negative might be as much of an indicator of a fake review, but absolutely slating a product and recommending a rival in the same post can be a clue that it's part of a smear campaign. Of course, it also might be genuine – so, if you can look at the reviewers other reviews, to see if they've been on a spree of similar sounding missives.

At the end of the day, there's no way of knowing 100% for sure that what you're reading is a real review, but if you're going to make a big purchase, try reading reviews on multiple different websites to get as wide a range of opinions as possible. That way, you should minimise your risks of being fooled.

companies offering rewards to customers who wrote positive reviews, and a whole economy based around the provision of fake reviews. Sites like Fiverr (**fiverr.com**) are commonly used by businesses in search of people to post fake reviews – using either their own names or fake profiles they've set up in the past and built up a history with, to give their reviews a bit of credibility. A BBC investigation into fake reviews discovered that some fakers even steal the names and photos of the recently deceased to attempt to legitimise their lies, which gives the whole enterprise a grim extra twist.

For the really ambitious (or deceptive), there are so-called 'marketing' companies who'll write hundreds of reviews across multiple platforms, all without the reviewers ever setting eyes on the things they're writing about. The publishing industry seems to be a particular target for unsavoury reviewers, with several enterprising freelancers offering first-time authors adoring reviews of their book on various websites which, they claim, will help boost their books onto bestseller lists. The going rate is around $1000 (in the region of £700) for 50 reviews.

To make matters worse, the CMA noted that some review sites accept money from businesses to suppress bad reviews and publish only positive ones, all in the name of 'reputation management.' With all of that going on, any even vaguely complimentary reviews can start to look a bit suspect.

Striking Back

Before you give up reading reviews entirely, though, take heart. Sites like Amazon and TripAdvisor are aware of the problem, and they're working to remedy it. Plus, as previously mentioned, organisations like the

▲ *Looks good, but what if all those positive reviews weren't real?*

Can Artificial Intelligence Weed Out The Fakes?

There are some things in a review that might indicate you're reading a fake, and generally you might find you just get a 'feeling' about a review. Computers, however, may be able to do and even better job?

At least that's what researchers at Cornell University reckoned, so they developed Review Skeptic, a tool for testing the truthfulness of reviews. By analysing the kind of language and sentence structure used in a review, the tool then decides whether or not it's a real review, or a puff piece.

At the moment, it's best at judging hotel reviews – but even so, in tests, the Review Skeptic had a 90% hit rate, while human subjects only had a 50% chance of spotting the fakes. The Cornell researchers suggested that something like this could be used as a first line of defence on review websites like Yelp, where it could weed out the majority of fakes before they ever got published.

If you want to try it for yourself, you can paste in a review at reviewskeptic. com. In *Micro Mart*'s completely unscientific tests, it had a 100% hit rate, even when the reviews weren't about hotels, so it might well be worth a try.

Using Bad Reviews As A Weapon

If you're an eBay seller, you might already be nodding in recognition, but it turns out that online reviews can be a double-edged sword. Just as businesses can plant made-up reviews of their product online, so customers, too, have spotted a way to make online reviews work in their favour – by threatening to leave negative reviews if they aren't given discounts, preferential treatment, or even freebies.

Just as eBay sellers might feel held to ransom over a buyer threatening to leave negative feedback for unjustified reasons, so too might restaurants and hotels start to feel under fire from reviewers threatening one-star reviews of their establishments. It's hard to prove, of course, since opinions are so subjective, but the CMA heard several reports from businesses who felt they'd been blackmailed by keyboard-happy shoppers. So that's yet another thing to bear in mind when you're reading online reviews.

CMA are starting to flex their legal powers to crack down on dodginess.

Take TripAdvisor; anyone can submit a review for any listing on the site, without any proof of actually having been there. Reviews are screened, however, using automated tools designed to flag up fake review warning signs (and spam) to be checked over by the company's moderators to check out. The site also relies on its community of users to flag anything that might need investigating, so in theory, the reviews should be fairly trustworthy. In practice, there's still plenty of chance for the better written fakes to make

it onto the site, especially if they're for lesser-known establishments that maybe don't already have many reviews.

Amazon, too, is fighting hard to get rid of fake reviews on its pages. The online retail giant has filed lawsuits against literally thousands of reviewers for leaving false or misleading reviews on products it sells; back in April 2015, Amazon targeted a number of websites offering reviews for sale, including **buyamazonreviews.com** and **byazonreviews.com**, while in October, it went after Fiverr users who were advertising their reviewing skills through the site.

▲ It's hard to imagine booking a hotel without checking the reviews online first, but how can you be sure the reviewers can be trusted?

▲ Reviews of just about anything are available online now, so you can see what other people are saying…

Be Careful Out There

Fighting fake reviews feels a bit like fighting spam, and the motivations driving the proliferation of both are similar, too. It's a tough battle to fight, and as the tools for detecting and weeding out fake reviews improve, the people writing them will only get cleverer.

The whole thing is rendered trickier by the fact that companies really want legitimate customers to write reviews – if you've ever bought anything online you've probably experienced the nagging emails that seem desperate for you to go back and review your item – and some of the methods for discouraging fake reviews also discourage real ones. Last year food critic Jay Rayner spearheaded a Twitter campaign asking TripAdvisor to require reviewers to scan in their receipts before writing restaurant reviews, to prove they'd really eaten there; it would definitely stop people from buying fake reviews, but might also put off genuinely happy customers, because who wants to faff around with scanning receipts?

The crackdown from the CMA is promising, though, and will hopefully serve to put other businesses off selling similar services. Ditto Amazon's legal action – because you know Amazon can afford brilliant lawyers, if necessary.

For now, though, if you're considering buying something or trying out a new restaurant that seems to have reviews that vary wildly in their opinions of the product, be a bit careful. Some of those reviewers might not be who they say they are. **mm**

According to Amazon's filing, the defendants were variously accused of trademark infringement, false advertising, and of violating the Anti-Cybersquatting Consumer Protection Act and the Washington Consumer Protection Act. That suggests that at least part of Amazon's ire was over the names the fake review sites were using, but the false advertising is genuinely an issue too, because Amazon's reputation could take a hit if it allowed fake reviews to go unchallenged. To that end, Amazon is also using software to ensure that reviews by verified customers are more prominent on product pages than others.

Then there's the CMA's action. As part of its investigation into online reviews, the CMA discovered a company called Total SEO & Marketing Ltd, which had published more than 800 fake reviews online between 2014 and 2015. The reviews were spread across 26 different websites, and raved enthusiastically about some 86 different small businesses. When challenged with its breaches of UK consumer law, Total SEO agreed to stop writing these reviews, and to take down the ones it had already published. On top of that, the CMA got in touch with all of Total SEO's clients, explaining that the work Total SEO had done was illegal, and advising them against hiring anyone to do similar work in future. No financial penalty was issued, presumably because Total SEO cooperated; if it hadn't, there might have been further consequences.

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DIY Fake Reviews

Some of the worst culprits for writing fake reviews are, well, writers. Over the past few years, there have been several scandals where authors have been caught writing 10/10 reviews of their own work under an array of different pseudonyms. Crime writer R.J. Ellory copped to giving himself positive reviews on Amazon, while his fellow crime novelist Stephen Leather was also found to be writing damning reviews of his rivals' books, talking up his own work in the process.

Even screenwriters aren't immune from the lure of self-promotion; for example, illustrator and screenwriter Monte M. Moore posted a 10-star review of his own movie, *Spirit Hunters*, on the IMDB. In the review, he mentioned getting "the opportunity to review the screener", but didn't try very hard to hide his identity, using the same handle he uses for his professional Twitter account. Oh dear.

8 out of 18 people found the following review useful:

Excellent Indie Film, even if you don't like ghost hunter shows.
★★★★★★★★★★
Author: studioscarab from United States
5 February 2012

I've had the opportunity to review the screener before the film was released, and was pleasantly surprised. End of the Road has some names you'll know like Doug Jones and Robert Picardo, but also some I've never heard of. At first this film seems like it's going to deliver just what is expected, a film about some ghost hunters, but without spoiling anything, I can tell you "watch it til the end", because I'm guessing you won't have seen it coming. I doubt this film had a big budget to work with, but it seems like they made every penny count. Really solid performances and story without all the H'wood cheesiness from the studio films. Check it out.

Was the above review useful to you? Yes No (Report this)

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The Rise and Fall of Apple QuickTime

As Apple calls time on its PC video framework, Mark Pickavance charts its ultimate demise

Apple has generally taken the view that it only supports its own computers and not those made by other companies. But there have been exceptions to that rule, and QuickTime was one of them. But eventually the cost of maintaining this technology has clearly outweighed its usefulness for this unusual solution.

The rise and ultimate fall of QuickTime is a tale worth recalling, for those unaware of its curious history.

How It All Started

With the advent of Windows 3.x on the PC, Apple was looking for things it could do on the Mac that couldn't easily be done by its x86 brothers. One of those areas was media manipulation, and it saw

this as another growth area that it could develop, using Adobe's Postscript model that saw it become a major player in desktop publishing in the 80s.

Apple released QuickTime 1.0 for Mac System 6 in December 1991, and in the following year it confronted expectations by extended that concept beyond the Mac by announcing a Windows PC version.

The PC version of QuickTime would be exclusively a playback solution, because Apple's intention was that anyone working with media would be using a Mac, obviously.

QuickTime 2.x appeared on both platforms in 1994, although by this stage on the Mac it was bolted directly into the operating system, whereas on the PC it was wasn't.

At this time, pre-DirectX, the video and drawing APIs of Windows were pretty poor, so the PC version of QuickTime could only compete with its Mac cousin by directly accessing the video hardware, much like games of this era did.

Microsoft wasn't thrilled that Apple had effectively deployed a major software component on its territory and then used it to directly access the hardware. It already had its own solution called Video for Windows. The problem with VfW was that it didn't access video hardware directly, leading to a large performance difference with Apple's tech.

> 66 **Microsoft wasn't thrilled that Apple had effectively deployed a major software component on its territory** 99

It's worth noting that at this time, around 1995, Apple and Microsoft were engaged in a long running dispute about Microsoft's appropriation of ideas that Apple believed it owned, which were used in Windows. Had this not been the case, Microsoft and Apple might have reached an arrangement about QuickTime licensing, avoiding much of the unpleasantness that followed.

Realising that the PC needed good media playback, Intel got involved and employed a business, San Francisco Canyon, to create a video driver that could provide VfW with comparable performance to QuickTime. It did this knowing that Apple had used the same company to build the video driver for the PC port of QuickTime, and gave it a stupidly short time-frame to deliver it in.

Everyone involved got the hint, even if Intel didn't explicitly tell them what they should do.

Seeing the obvious opportunity, Canyon just rehashed its Apple code and indirectly licensed it to Microsoft.

Apple sued and Microsoft quickly folded, and the agreement they ultimately reached forced Microsoft to concede the following:

- A cross licensing agreement.
- A five-year deal for continued development of Office for the Mac platform.
- The designation of Internet Explorer as the default Mac web browser.
- $150 million investment by Microsoft in Apple.

This experience was valuable exercise for Apple, because it realised that it could make money from other platforms, if it was prepared to take some of its technology and create a beachhead on foreign soil.

It's important to understand that Apple was in an odd place at this time. Steve Jobs had left the company in 1985 and didn't return until 1997. At the start of the 1990s, the company was going through a very difficult financial period, and the arrival of Microsoft Windows could easily have finished it off.

The Escape Plan

What Apple realised in the mid-90s was that having its own hardware architecture was a massive drain on resources, and despite the marketing message, it was mostly window dressing.

Apple's own efforts with QuickTime for Windows proved as much, and the cost of developing new PowerPC processors with Motorola and IBM was prohibitively expensive. It knew even then that it would eventually move to an architecture controlled by others, whatever its engineers wanted.

This thinking strongly influenced the development of QuickTime, and Apple worked hard to build much of the functionality into an abstracted layer that wasn't hardware dependent.

Referred to as the QuickTime Media Layer, it was designed to sit between the OS and the hardware, much like DirectX would later for PCs, and enable applications to take advantage of hardware features without being explicitly aware of them.

QuickTime was therefore referred to as a 'framework', though most people saw the player and assumed it was just an application.

The underlying technology was orientated to both the presentation and the creation of content, and soon Apple expanded its media repertoire from music and video into VR presentations with QuickTime VR, in an attempt to see off Microsoft developments in these areas.

Those concepts, like Microsoft's Active Movie, didn't actually dent the popularity of QuickTime, but they did become the basis for a radical new media API called ActiveX and eventually DirectX.

While Microsoft moved ahead with its plans, Apple got massively side-lined, as it tried to develop its new OS, called System 8, codenamed Copland. This project failed horribly, leaving Apple with a major headache.

The Copland disaster had wide ranging consequences for Apple, one being that many of the engineers responsible for QuickTime left.

As a desperate measure, it was forced to purchase Steve Jobs's NeXT company in order to get its NeXTSTEP OS, which it then relaunched as Mac OS X.

Luckily for Apple, all the cross-platform work it had done previously paid off, and it soon released QuickTime 3.0 with new hypermedia functionality, starting the fashion for interactive media presentations and games.

At this time, Apple still held sway with authoring tools, but the PC world really wasn't keen on Apple's influence, and Microsoft was actively looking to stop QuickTime on Windows.

Much of how Microsoft tried to lean on Apple to end QuickTime at this point came out in the subsequent anti-trust litigation that Microsoft become embroiled in, as it had decided that video playback on Windows would be entirely controlled by itself.

One especially underhand method Microsoft used involved it buying shares in media software house Avid, and then getting it to strip QuickTime out of its content creation tools, like Avid Cinema. Avid's products at this time were second only to Abobe's Premier suite for popularity, and with these moves Microsoft demonstrated it wanted QuickTime to leave the PC market, feet-first if necessary.

But Apple had friends in high places and MPEG-4 encoding/decoding up its sleeve.

The Golden Years of QuickTime

In 1998, internet usage was truly exploding, and many people were looking to make it as rich and interesting an experience as possible. One of the major problems was that many people were connected via dial-up, with performance that would make paint drying look like time lapse.

Therefore, technologies that could deliver a rich experience with minimal download times were technological gold. Microsoft had ASF, Macromedia had Flash, RealNetworks had RealAudio and RealVideo, and Apple had QuickTime.

MPEG-1 and MPEG-2 weren't really suitable for sending video over the internet, so many looked to MPEG-4 to deliver that dream, including Apple, which had bound this technology into QuickTime.

Apple also managed to get the Motion Pictures Expert Group to approve QuickTime as the container format of choice, rather than Microsoft's ASF, and that started an association that went on for many years, whereby movie trailers were presented exclusively in QuickTime format.

As the millennium came and went, Apple used QuickTime as a critical framework for an entirely new generation of software products. Some of these were Mac specific, but a few like iTunes

were also on PC. The appearance on iTunes in 2001 marked a seminal year for Apple, as it also introduced QuickTime 5.0, iMovie and the new brushed metal motif that it would use heavily in Mac OS X 10.1.

The groundwork done then was critical, because the following year Apple launched the iPod and the iPhoto application, along with updates for iTunes.

A year later, it released QuickTime 4.0, adding support for internet streaming using open protocols, and with surprisingly forward thinking, it even offering QuickTime Streaming Server as an open-source project.

Alongside this, it also developed a server technology, QTSS, aimed at supporting the other end of the streaming problem. Apple had taken what was a video playback layer and turned it into a media access tool that anyone using the internet on a PC needed to install.

PC owners could get simple playback for free, but the Pro version that allowed you to save downloaded movies was a paid product, frustratingly.

From this point, Apple's QuickTime became the go-to product for video presentation on both the PC and Mac, despite Microsoft's best efforts to stop this happening.

> ❝ **QuickTime 7.x was released on 29th April 2005, and 11 years later it still hasn't made it to 8.x on the PC** ❞

Top Of The Hill

With each new iteration, Apple delivered exactly the features that users craved. Support for MPEG-4 part 2 and AAC audio came with QuickTime 6.0 in 2003, and simultaneously iTunes 4.0 supplied pioneering support for AAC encoding and playback. And with QuickTime 7.0, it got on the Blu-ray technology bandwagon even before it existed, with support for H.264 or AVC.
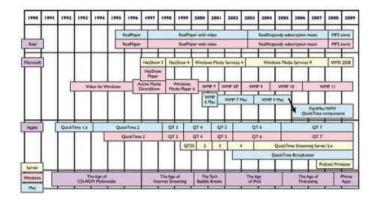
Soon, iPods had screens that could display TV shows and films bought through iTunes, and hardware acceleration was added by allowing the QuickTime display to be an OpenGL layer.

However, a few cracks had already started to appear, as Apple tried to cut itself loose from the pre OS X era solutions, and it made many of the new versions only available to Mac OS X.

It was also at this point that the PC side of the QuickTime equation started to be less exciting to those in Apple development, who focused on bringing the coolest features to Mac OS X Leopard well ahead of the PC version.

QuickTime 7.x was released on 29th April 2005, and 11 years later it still hasn't made it to 8.x on the PC, though there have been numerous lesser releases since.

What's characterised these interim releases has often been the removal of features and not the adding of new ones. For example, in version 7.3 Flash support disappeared due to 'security concerns', and in 2009 the native ability to display QuickTime VR created panoramas also vaporised. A plug-in that allows QuickTime VR was removed in 2015, so anyone with those files will need to write their own solution. By 2008, Apple had stopped adding new features to QuickTime 7.5, and with the 7.6 release it was no longer installed automatically on Mac OS X.

QuickTime X arrived for Mac OS X 10.6 in 2009, and it's been incremented since with each OS X release, supporting Mac OS X 10.11 with QuickTime 10.4.

The PC, on the other hand, got stuck on QuickTime 7.7.9, a product designed for Windows Vista and 7, and it never evolved for Windows 8 or 10.

For those who used QuickTime on the PC for video editing, it soon became apparent that Apple wasn't interested in fixing a number of glaring problems with the product, some of which will never be addressed. These included an inability to encode H.264 on dual-CPU systems unless Hyper-Threading or cores are disabled.

In April this year, two zero-day advisories were issued for the PC version of QuickTime, and when this was brought to Apple's attention, it responded by saying that "QuickTime 7 for Windows is no longer supported by Apple".

From version 7 onwards, the relevance of this product to both Mac and PC owners rapidly declined, unless they were specifically involved in video editing.

Abobe in particular seemed oddly wrong-footed by this and is now scrambling to deliver alternatives to those who use related editing apps. In a quick statement it released a few days after Apple's bombshell, it said, "Adobe has worked extensively on removing dependencies on QuickTime in its professional video, audio and digital imaging applications, and native decoding of many .mov formats is available today (including uncompressed, DV, IMX, MPEG2, XDCAM, h264, JPEG, DNxHD, DNxHR, AVCI and Cineform). Native export support is also possible for DV and Cineform in .mov wrappers,"

In the meantime, those users affected must retain QuickTime for Windows despite knowing that it has at least two critical security flaws and that the Apple website advises that PC owners should remove it unless they specifically need it for another application.

Final Thoughts

Many consider that the writing was on the wall for QuickTime at the point when Apple stopped delivering movie trailers that you could download. But actually it was a dead man walking once YouTube became the go-to solution for streamed video and Apple could no longer be bothered to maintain something without a tactical reason for existing in the first place.

Had Microsoft delivered a proper video decoding and encoding API when it should have, QuickTime would have been an exclusively Apple experience.

Ultimately, its true value was probably allowing Apple engineers to think about hardware abstraction when this was an important skill to move Apple away from the failed System 8 and into the NeXT initiative. That then paved the way to an Intel

hardware transition, without which it's unlikely that Apple would still make the Mac.

For the PC world, QuickTime ended up as one of those annoying applications that you were forced to install on a new PC so it could enjoy some file formats. But whenever you went to play a file, QuickTime would either insist on an update that removed features it previous had or would fail to play properly with no obvious explanation as to why.

I removed QuickTime a couple of years ago, because it was the only Apple software I had on my system, yet its ability to bug me with its Apple update service outweighed all the other apps by a factor of ten. Once installed, the service repeatedly tried to push iTunes on me, undoubtedly one of the worst Windows apps ever created.

The problem is that some people are forced to keep it because for whatever reason they have video mastering tools that insist it's installed, even if it's no longer supported.

Those on the Mac OS X platform will continue to have QuickTime, though its relevance is now massively diminished even on the Mac.

It's a foundational piece in the jigsaw of what defines the modern PC, yet very few people in the PC community will shed a tear for QuickTime, unless it's one of joy at its demise.

It's remarkable that it lasted this long before Apple put it out of our collective misery and that so many video applications used it. The history of QuickTime now serves as a stark warning to those using technologies that have outlived their usefulness, regardless of who created them and their original motivations. **mm**

QuickTime TimeLine			
	QuickTime For Mac	**QuickTime for Windows**	**Microsoft Video**
1991	1.0		
1992	1.5		Video for Windows
1993	1.6		
1994	2.0		
1995	2.1	2.x	
1996			Active Movie DirectShow
1997			
1998	3.0	3.0	Windows Media Player 6
1999	4.x	4.x	
2000			WMP 7
2001	5.0	5.0	WMP XP
2002	6.0	6.0	
2003			WMP 9
2004			WMP 10
2005	7.0	7.0	
2006			WMP 11
2007	7.2	7.2	
2008	7.5	7.5	
2009	10.x	7.6	
2010			
2011		7.7	

NHS Fined Over Data Breach

'8Pack' Creates Case For Overclockers UK

First design from muscled master

Ian '8Pack' Parry is one of the world's finest professional overclockers. He's also got a physique that would rival Arnie's, so you won't hear us badmouthing him and his unique nickname. Ever.

8Pack has now developed an aluminium case in conjunction with Lian Li that will be stocked by Overclockers UK but, alas, it has a rather more wordy title than 8Pack's: the PC-D888WX ATX Cube PC Chassis. The D888WX has liquid cooling support with six separate radiator mount options including up-to-360mm radiators on the bottom and rear of the case, two 360mm radiators on the top of the case, another 120mm radiator on the rear of the case and a 480mm radiator on the front of the case.

Hardware support includes space for E-ATX motherboards of all sizes, 420mm VGA cards, 420mm ATX PSUs, 165mm CPU coolers and a pair of HDD racks that can support six 3.5-inch HDDs or four 2.5" HDDs. Four USB 3.0 ports and HD audio/microphone connectors sit the front I/O panel and you can read much more on this at **www.overclockers.co.uk**.

You'll even be able to see a lovely photo of Ian – sorry, Mr 8Pack – on the site.

Patient details leaked last year

The Information Commissioner's Office has taken significant action against the NHS over last year's leak of patient details at a sexual health clinic. You may remember the case of London's 56 Dean Street clinic, which issued a group email newsletter without using the "BCC" field. Naturally, this revealed the email addresses, and in some cases full names, of hundreds of patients to each other. It's now been labelled as a "serious breach of the law" by the Information Commissioner, with the NHS Trust operating the clinic being fined £180,000 as a result. This is clearly a very serious and sensitive case for all concerned the ICO's investigation of the clinic showed that this wasn't the first time such a mistake had happened.

Free Windows 10 Upgrade Ends In July

£100 after that... So make your mind up quickly

Well, it was never going to last forever, and now Microsoft has officially announced that the free upgrade offer to Windows 10 will come to an end of July 29th. After then, consumers will just have to go pay for the operating system.

The company has always suggested that users would have to pay for the upgrade somewhere down the line and it's allowed plenty of people to try Windows 10 for free, in fairness – it's now on 300 million active devices around the world, according to a Microsoft blog post. From July 29th, UK users will have to pay £99.99 for the OS, which is probably fair enough.

In other, entirely non-related news, Microsoft has also contacted users of its Windows Live Mail service that are currently using it with Outlook.com that they won't be able to for very much longer. Basically, Windows Live Mail 2012 doesn't support Outlook. com anymore so consumers are being advised to download the Mail app on Windows.

Alternatively, people can sign up for a free one-year subscription of Office 365 Personal and use Outlook 2016.

When Intel decided it was going to start making low-power processors for mobile devices, it was a bold but not unrealistic move. Yes, it would be competing against ARM, a company that already had decades of experience in this field and a strong foothold in the market, but this was Intel we're talking about – a company with deep enough pockets and strong enough alliances to actually make such an endeavour work. As it turns out, though, it seems this foray into mobile territory has been a significant failure, and it leaves Intel with some huge decisions to make regarding its direction in future.

Sadly, apart from the financial cost of this failure, many of the company's employees are going to find their jobs are the price they pay for not usurping ARM.

Of course, this isn't the only reason for imminent cuts, and it's also true that Intel is having to cope with a shrinking desktop PC market too. But there's no doubt Intel's failed investment in this area hurt it.

My thoughts are with the many talented people who will be shown the door, and I hope they find new opportunities quickly.

Anthony

Meanwhile... On The Internet...

The term 'social media' is an interesting one. Quite possibly the technological buzz-phrase of our times, its derivation is probably tied in with AOL and its development of early web services, such as its Messenger application (**tinyurl.com/MMnet14a**). Certainly, one of the people with a claim on coining the phrase first, Ted Leonsis, is intrinsically linked with the company's early days, while one of the others, Tina Sharkey, who registered the **socialmedia.com** URL in 1999, worked at the company in the early naughties. Possibly the claim with the most provenance, however, is that of Darrell Berry (**@darrellberry** on Twitter), who can verify his use of the term in the correct context as far back as a paper he wrote on 'Social Media Spaces' in 1994. But we're not really here to discuss who coined it first right now, but rather what it actually means.

Sharkey claims that, while she was working at iVillage in the mid-90s, she concluded that the new communities being created by the proto-social network were (**tinyurl.com/MMnet14b**) "not like service media, and it's not quite informational media — it's 'social media!'" due to the fact that "It wasn't media we were creating – it was media we were facilitating."

This definition puts the idea of user-generated content (latterly comprehensively co-opted by marketing concerns: **tinyurl.com/MMnet14d**, and subverted by nefarious contributors, as illustrated by Sarah Dobbs' feature on fake reviews in this very magazine) at the front and centre of the equation, which is largely how we've come to understand the phrase. Indeed, it somewhat builds on Berry's thesis that the internet needed to evolve from a repository of static information to a dynamic sharing of information through interaction – essentially the blueprint of the Web2.0 revolution of the mid-2000s (**tinyurl.com/MMnet14c**), which effectively kick-started the meme-filled trend-tastic social media we know today.

The core of social media is not being sociable, though. The old web allowed conversation by aiding contact between people and the exchange of information electronically. Social media, though, is about creating a digital society, allowing groups with similar interests to coalesce easily. That's what Facebook Groups are, and the purpose of hashtags, trends and link sharing is.

Social structures, however, are complicated, with both positives and negatives, and every new form of social media interaction eventually highlights this truism in the ways it is used. We've reflected on this phenomenon in the past while commenting on the way, say, Reddit and Twitter are used to troll and abuse certain groups or individuals, sometimes in horrible ways – because prejudices within our society also, inevitably, become prejudices within social media spaces. We've also discussed how the initial *laissez faire* vibe of the online world eventually created some noxious atmospheres as we, like we have to IRL, balance free speech with attempts to create comfortable places for everyone. It's a never ending, never easy task.

Thus, when entirely new forms of online interaction become available, it never takes long for them to expose some of the darker places the world can take us. For example, the current social media battleground is live streaming – instigated by start-up Meerkat (**tinyurl.com/MMnet14e**), but latterly dominated by Twitter's Periscope (**www.periscope.tv**)and Facebook Live (**tinyurl.com/MMnet14f**). While undoubtedly an exciting new innovation in the eyes of those tech giant, a couple of recent events have caused concerns over how such technology can be governed.

The first was the story of an Ohio teenager who allegedly used Periscope to livestream the rape of a 17-year-old girl (**tinyurl.com/MMnet14g**) by a 26-year-old man, the alleged crime apparently having been reported to the police by someone who viewed it all online. It's not the only case of illegal activity taking place on the app, of course (**tinyurl.com/MMnet14h**) – and there was even an unfortunate incident where a man was shot and killed while livestreaming from a Florida strip club (**tinyurl.com/MMnet14i**).

Then, of course, there was the rather horrible story of the young French girl who used Periscope to stream her own suicide (**tinyurl.com/MMnet14j**) at a train station just south of Paris. Again, the police were informed of the events unfolding by somebody who was viewing the girl's increasingly worrying Periscope streams but were unable to reach her in time to prevent her actions. It's an event that, again, calls into question exactly how such technology affects people and whether it's shaping people's actions as well as merely reflecting them (**tinyurl.com/MMnet14k**). It's a thorny issue and one that will shape our perception of social media going forward.

Who, for instance, could have imagined the role Twitter and Facebook would have on radicalisation and the 'War On Terror', or politics in general (**tinyurl.com/MMnet14m**)? Or how it could have shaped political revolutions? We're pretty sure not even Zuckerberg or Jack Dorsey saw that coming when they were helping create and shape the platforms they are now synonymous with.

The thing is, social media itself is not dangerous, but the way it's used can be (**tinyurl.com/MMnet14n**), it would seem. It's not yet a mature media either. We users are effectively shaping it, on the hoof, in our own images. Some of those images, however, are not pretty (**tinyurl.com/MMnet14l**). Thus, once again, we're left wondering whether something should be made, just because it can be.

For now, while authorities still struggle to deal with technology's effect on wider society (**tinyurl.com/MMnet14o**) in many different ways, and even control it (**tinyurl.com/MMnet14p**), we are often left to try to figure out how it all works ourselves (**tinyurl.com/MMnet14q**) and navigate and understand it as best we can. Not an easy task.

.AVWhy?
Videos For Your Eyes...
Not Necessarily For Your Brain

If you didn't read last week's disclaimer, you may have missed the little missive outlining the fact that our esteemed editor is no great lover of a galaxy far, far away – a place we regularly visit in this little corner of the magazine. So in the interest of balance, this week we bring you two videos connected to the world of *X-Men*. The first shows James McAvoy's transistion from his trademark hirsute Prof. Xavier, to the more aerodynamic version we know and love (**tinyurl.com/MMnet14r**), while the second is total Dubsmash gold (**tinyurl.com/MMnet14s**)

QUICK BITS... Another Google self-driving car has been involved in a crash in California, but the driver of the other

Caption Competition

"I'm not sure if my wife is really leaving me because of my gambling addiction. She might be bluffing."

You good ladies and gentlemen certainly went all in for the Caption Competiton in issue 1212 – which featured the chap you see above... Here are the best bets:

- **JayCeeDee:** "Microsoft go all in with Windows 10."
- **Thomas Turnbull:** "My 3D printer laptop combo even prints out the winning chips."
- **Sam Yekta:** "Old-fashioned gambler fails to grasp the concept of online poker."
- **James Costar:** "My computer's going to be really fast with all these chips and cards."
- **doctoryorkie:** "Good luck getting that SD slot to read those cards."
- **Ondrive:** "My mates said I should buy a normal desktop PC, but I went for an 'all-in' one instead."
- **Martin Prince:** "This guy is suffering from a Stack Overflow"
- **BullStuff:** "What happens when you find a USB stick on the bookie's shop floor…"
- **Thomas Turnbull:** "I'm on a roulette site in Russia but apparently you need a gun and not roulette chips."
- **JayCeeDee:** "Fred was delighted that the royal flush in his hand had nothing to do with Windsor Castle sewers."
- **Robert Wheelhouse:** "A city banker hard at work with your money."
- **Rob Baker:** "Folding@home."

The winner, however was doctoryorkie with "I'm not sure if my wife is really leaving me because of my gambling addiction. She might be bluffing."

If you have a caption for the picture below, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**), or email us your funnies via **caption@micromart.co.uk**, remembering to add the issue number to the email.

Space Invaders Invades Game Hall Of Fame

Iconic classic makes the grade

The World Video Game Hall of Fame has inducted some new titles during its sophomore year. *Space Invaders* is arguably the most notable inclusion, if only for the fact that it wasn't already on the list, which seems strange. Recognised alongside the 70s classic were *The Oregon Trail*, *Grand Theft Auto III*, *The Legend of Zelda*, *The Sims* and *Sonic the Hedgehog*.

The Hall of Fame – **tinyurl.com/hb2zdgm** – is based in New York's Strong Museum, and selects its entrants according to various criteria, including longevity and influence on the world. Now these six titles will be on permanent display at the national museum of play, alongside the inaugural inductees from 2015 that included *Pong*, *Pac-Man* and *Doom*).

We have very fond memories of playing some of these titles, although *The Oregon Trail* passed us by. Sounds great, though: "You have died of dysentery". Lovely.

Security Problems Weigh Down UK Firms

Two-thirds of UK firms detected system breaches

The government's latest Cyber Security Breaches Survey has revealed that two thirds of firms in the UK have detected a security breach on their systems over the past year. Furthermore, a quarter of those companies experienced a breach at least once a month.

The report also revealed that nearly seven out of ten attacks were based on viruses, spyware or malware and that the average cost of a security breach to a large business was £36,000 a time. In one case, a company lost £3m to a cyber breach.

EA Exec: Consoles Won't Be Around Forever

Looking to a streaming future

While it may seem difficult to imagine, it is quite possible that video game consoles will not be around forever. The plain fact is that data streaming has altered music and video consumption and it is perhaps naive to assume that it won't have a similar impact on the gaming market eventually.

This is certainly the view of Peter Moore, chief competition officer of Electronic Arts. In an interview with online source *Daily Orange*, Moore said that games in the future will be reliant on streaming. "I'm not sure there will be consoles, as we know them anymore… Games will be accessed by streaming technology, so we don't need hardware intermediaries in between the two."

He went on to say that games will be accessed by whatever monitor you happen to have in your home via a chip, rather than via a box, and that the current consoles from Sony and Microsoft are pretty future-proofed as it is.

It may seem odd to think of a world without consoles but then we remember playing *Jet Set Willy* on a cassette tape. Times change.

Want To Help Turrican II Soundtrack Become "Epic" Album?

Orchestral manoeuvres via Kickstarter

How could you not be interested in this? Renowned video game music composer Chris Huelsbeck has launched a Kickstarter campaign to help fund *Turrican II – The Orchestral Album*.

The timing of the project coincides with the 25th anniversary of the Amiga classic, the grand aim being to turn this 16-bit soundtrack into an orchestral epic. This comprise of almost an hour of newly-arranged music featuring some of the game's best melodies – *Concerto for Laser and Enemies*, anyone?

Huelsbeck is looking to raise $75,000 to help secure the arranging, recording and production costs, and there are various funding tiers people can opt for, from digital downloads and physical CDs to experiencing one of the orchestra sessions live. The campaign for this ends on May 28th, so head for **www.timedate3025.com** if you want to get involved.

QUICK BITS… A Spotify exec has said that the service has witnessed a faster pace of growth since

Time To Unplug, Again

Will you be taking part in National Unplugging Day?

Mark it in your calendars, folks: National Unplugging Day is on Sunday, June 26th.

Now in its second year, the day calls on people to put down smartphones, tablets and computers for a 24-hour period. The big idea is to remind us all of what it's like to live a life unplugged while also raising awareness of the harm that digital devices can do to family life, potentially damaging relationships between friends and family as kids, in particular, are immersing themselves in their digital devices for hours on end.

Parenting website MyFamilyClub has carried out a study of over 2,000 parents across the UK and it's found that the average parent spends up to five hours a day on a smartphone while 80% of kids spend four to five hours a day on digital devices. If you are a parent and you're in agreement with the 87% in its study that agreed technology is damaging to their children's childhood, show your support at **nationalunpluggingday.co.uk**.

Mobile Phones Don't Cause Cancer, Says New Study

30-year study shows no link

The University of Sydney has carried out a study over a period of 30 years into any correlation between mobile phone use and brain cancers, and it's concluded that there was no increase in cancers despite the huge uptake in phone use.

The study looked at thousands of men and women diagnosed with cancer in Australia between 1982 and 2012, alongside mobile usage data from 1987 to 2012, to come up with its conclusion that brain cancer incidence rates over that period had risen only slightly in males and were stable in females.

Perfect Score Recorded By Donkey Kong Master

Proof posted on Facebook

Wouldn't it be great to hold the world record for something? Perhaps you fancy yourself as a champion gamer of a certain title, and wonder how great it would be to have the world recognise your world-beating achievements?

Of course, when it comes to *Donkey Kong* the setting of world records has been a mightily contentious affair (if you haven't seen the fantastic film *The King Of Kong: A Fistful of Quarters*, may we urge you to seek it out immediately). Many a record has been set and broken over the years but now, it seems, the pinnacle may have been reached.

Wes Copeland, a bonafide star in *Donkey Kong* terms, has posted a screengrab on Facebook (and subsequently a three-hour-long YouTube video) of his achieving not only a new high score but doing so with a perfect run, scoring 1,218,000 in the process – which is, as far as we know, considered to be the highest score you can get. Copeland wrote that this would be his last record score "I don't believe I can put up a game any higher than this."

Can anyone else, though?

Liberty Reserve Head Gets 20 Years

Money laundering charges lead to jail time

Arthur Budovsky is known for setting up Liberty Reserve, a digital currency company allowing users to move money around anonymously. The service was subsequently used by a lot of criminals, who apparently – perhaps unsurprisingly – used it to move around their own ill-gotten gains.

Arthur's now in prison serving 20-years,must forfeit over $120m in company funds and has been fined $500,000 following his guilty plea for money laundering via what's been described as a "digital currency empire". According to reports, Liberty Reserve processed over $8bn worth of transactions around the world.

REVIEWS

Edifier Rave MP700 Speakers

A powerful portable and rechargeable Bluetooth speaker from Edifier

▲ *The MP700 looks a bit like a retro transistor radio*

▲ *Very minimalist design*

The latest trend for Bluetooth speakers has been smaller and smaller sizes, to the point where some of the units are about as much use as a bean can and a length of string. (If the analogy escapes you, ask your parents). Yet this latest offering from Edifier has gone in the opposite direction, with a quite large and, it must be said, heavy unit, which has a retro look more like a 1970s transistor radio. Let's hope it delivers the depth and power its presence suggests.

Following its logical numeric naming convention, the Edifier Rave MP700 is solidly built with an output to match. It's finished in mainly matt black, with a custom designed grill inspired by Moroccan trellis patterns. The controls are decidedly minimalist, with just three large buttons indented into the top of the case. They're multi-functional so, for example, a quick press will operate a different function to a press and hold. There's also a small flap on the side on the unit, hiding the 3.5" input socket, DC power input and a USB power output socket. This is designed to make more use of the eight hour battery fitted

to the speaker – for example, as a charging port for other mobile devices. Alongside the flap is a vertical row of small LEDs indicating the current state of charge; they also cycle when the unit is being charged.

As far as sound quality is concerned, this speaker can certainly hold its head up with the best in the business. The output is huge, both in volume and bass, quite able to fill the largest room with high-quality music reproduction from a smartphone. Naturally, the

sound source plays an important part in the output you get. So without a large range of source equipment, I can only tell you what the Bluetooth output was like from the sources I had available. I tested it with my Samsung Note 4, an Apple iPhone 5 and my wife's Samsung S5. I also used the supplied 3.5" cable, this time attached to my Sony amplifier, which seemed to produce an even fuller output than my phone. Suffice it to say, whatever you connect to it, you won't be disappointed.

The unit outputs 35 watts of total power from two 10W drivers and two 8W silk domed tweeters. It uses Bluetooth 4.0 for better streaming and includes NFC, so once it's paired with a device, you only need to be near it to reconnect automatically. The MP700 also has built-in digital signal processing (DSP) and dynamic range control (DRC). This is basically a method of analysing and filtering an analogue signal to improve its fidelity, and DRC will quieten loud sections and make quieter portions louder. This is normally used in the video industry where explosions are much louder than normal dialogue.

Unusually, while the manufacturer's suggested price is £199.99, I notice that Amazon UK is selling it for £229.00. Even more worrying is the fact that Amazon US is selling it for $229.00, which means that once again UK buyers are paying nearly twice what our US cousins are.
mm Joe Lavery

A somewhat chunky unit that provides a powerhouse of sound

micro mart

8 Quality
8 Value
8 Overall

Zoostorm Stormforce 805

Nothing but clear skies all the way with this VR-ready PC

EDITOR'S CHOICE
micro mart

DETAILS
- Price: £1599.99
- Manufacturer: Zoostorm
- Website: goo.gl/dqxft0
- Requirements: Monitor, keyboard, mouse

With the new generation of virtual reality systems now available, PC suppliers have to up the ante in terms of desktop performance to comfortably cope with the high-resolution virtual worlds delivered by the likes of the HTC Vive and Oculus Rift. It's not an easy task, and there's a fine balance between building a VR-ready system and one that's still affordable.

Zoostorm seems to have hit the nail on the head, though, with the launch of its Stormforce 805 VR Ready Gaming and Media Desktop. It comes with an Intel i7-6700K overclocked to 4.4GHz, a Thermaltake Water 3.0 Pro liquid CPU cooler, an eye-watering 32GB of DDR4 memory, a 512GB M.2 SSD for Windows 10 and a further 4TB WD Blue mechanical hard drive.

Graphics come courtesy of an Nvidia GTX 980 Ti with 6GB of GDDR5 memory from KFA2, and running at the stock 1000MHz GPU clock, with a boost to 1076MHz, together with a memory clock of 1753MHz. That's more than enough to drive high graphical settings in every game currently available, and crucially it's plenty to run VR games too.

In terms of performance, our 3D Mark 11 test of the

▲ The Zoostorm Stormforce 805, an excellently built system

Stormforce 805 returned an impressive score of 17,898, which one of the fastest we've seen from a single-GPU system. For the VR side of things, that's more than 5,000 points more than the recommended minimum.

We were also lucky enough to get hold of a HTC Vive, and running the likes of *Elite: Dangerous*, *Space Pirate Trainer* and *Call of the Starseed* was an incredible experience, as was *The Lab*. The Stormforce 805 handled everything perfectly well, and aside from the VR aspect, it ran every game in our library at the highest possible settings without any performance problems.

However, it's not just the specification that impresses us.

The Stormforce 805 is also one the most eye-catching and well presented PCs we've reviewed. The In Win 805 chassis, with its tempered-glass side panels, black brushed aluminium case and honeycomb-styled front panel all combine to great effect.

The two 120mm front fans emit a red glow, which neatly lights up the front panel, and inside you see a good degree of craftsmanship when it comes to the design and cable management.

There's room for upgrading too. The good choice of ASRock Z170 Pro4S is an ideal motherboard to base this PC on, especially since it features an Ultra M.2 socket. The ATTO benchmark saw the 512GB SSD return a write speed of

▲ The In Win 805 case is superb, as are the performance specs

458MB/s and a read speed of 541MB/s in the 8192KB test.

The Zoostorm Stormforce 805 costs £1,599.99, and while that may seem like a lot to spend on a single desktop, consider the specification, design and build quality of this PC. It's more than enough for the next generation of gaming, as well as virtual reality. On the whole, the price isn't too bad for a machine of this calibre.

If you're serious about taking your gaming to the next level, then you can't go wrong with the Stormforce 805 in your arsenal.
mm David Hayward

A superb gaming and media PC

micro mart
9 Quality
8 Value
9 Overall

Parrot Flower Power

Give your green fingers some digital help with Parrot's Flower Power

When this product arrived, it made me laugh. Partly because of the amusing packaging that sees it coming in a faux plant pot, but also because about a year ago I nearly built something identical while experimenting with Arduino computers.

Looking like a cleft twig, the Flower Power is a sensor designed to relay water, temperature, sunlight and fertiliser conditions to the avid gardener.

Once you've installed the AAA battery (provided) in it, you push the prongs into the soil, inside or outside, and then install the Flower Power app on your Apple or Android smartphone.

Communication is by Bluetooth LE, so that eliminates any iPhone before the 4S and those iPads that aren't third generation or better. Thankfully, most Android phones have it if they're less three years old, even the cheap ones.

Using Bluetooth, Parrot has been able to make the battery last at least six months, though it does come with some limitations I'll mention later.

A strength of this system is that the app not only provides live and historical data regarding your plant, but you can also identify the species, and the database of some 7,000 commonly grown plants and trees helps you tend for it. It will tell you if the soil is too dry or wet, if there's sufficient sunlight and if it's time to deploy some fertiliser. That allows you to move a houseplant to a location where it will grow better or add extra drainage for a waterlogged pot, among other things.

But (and this is a rather big caveat) the app doesn't automatically sync with Flower Power when you're near; you have to open the app for that to happen. Therefore what it doesn't do is avoid the biggest killer of plants: neglect. If you can't be bothered to water your plants, you're probably not going to open the Flower Power app every few days either.

And that's a problem here, because information transfers between the cloud and the device only take place under perfect conditions. The app must be open, Bluetooth has to be on, there needs to be a data connection for the phone, and you have

Features
- Monitor your plants' health directly from your smartphone.
- Flower Power app. Real-time alert of your plants' needs.
- Precision farming is at the tip of your fingers.
- The very latest generation of plant care.
- Easily take care of your plants on a daily basis.

Parrot®
FLOWER POWER
— ASK AN EXPERT —

to be within 30ft of the Flower Power.

Parrot's solution to this intermittent communication is to trend the data, so it can guess when you'll need to water and so on. That's fine, but it's far from the constant monitoring that one might have hoped for.

What this system badly needs is a little wall socket

wi-fi server that pings the Flower Power every hour or day and syncs, and relay that cloud based data so it can issue alerts to the phone. Indeed, the weakest part of

Flower Power, I've seen other potential uses that I really rather like.

One excellent use for this is to scope a location for planting. Imagine that

> **The must-have accessory for those who propagate plants**

this system is the need for a phone or tablet to connect and harvest data.

In theory, you can use 256 Flower Powers with one app, though I'm not sure who would be enthusiastic enough to monitor that many plants or spend the ten grand that 256 Flower Powers would cost you.

While I was mildly disappointed by the data pathways, since I've used the

you want to try growing a miniature orange or lime. That's a hefty investment in time and effort, along with the immature plant.

With the Flower Power, you can insert a sensor where in the garden you'd like it, tell the system that you've put one there, and see what it says about sun and ground conditions, avoiding a tactical mistake.

You can also use it to get a plant you're having problems with through a recovery stage, and then reuse the Flower Power elsewhere. For problem plants that you'd like to save, the Flower Power might well be the answer.

In both these respects, I can't see the need for more than one, unless you have lots of sickly plants. That said, given how much money and time you could save by having this sort of conditions management, buying at least one might be worth the investment.

I can't fault the styling and the quality Parrot's app, but the overall concept needs a little tweaking. Yet I'm confident the next generation of the Flower Power will address some of the problems I noticed.

If it does, this could become the must-have accessory for those who propagate plants and a contributory factor in the greater survivability of potted and garden species alike.
mm Mark Pickavance

Intensive care for your foliage

micro mart

7 Quality

6 Value

7 Overall

Synology DiskStation DS916+

A next-generation NAS design that offers huge storage potential

DETAILS
- Price: £442.80 DS916+ (2G) £480.00 DS916+ (8G)
- Manufacturer: Synology
- Website: www.synology.com
- Requirements: Wired network with channel bonding switch

With Synology's penchant for reusing its enclosures, it's easy to assume that what's inside remains unchanged.

From the outside, the new DiskStation DS916+ looks almost identical to the DS415+, but internally it has more in common with the company's recent DS716+.

For those confused by the naming conventions, the first number is the number of drives the system can accept, and then the last two numbers are year of launch, as in DS116 and DS216j.

However, the DS716+ and now the DS916+ take two and four drives, respectively. How does that work exactly? It's correct, because both these units can bridge through an eSATA port to a second box, the DX513 or DX213, allowing more drives to be added.

Because the DS916+ has four bays and you can use the DX513 with five bays with it, the total drive capacity of this system is nine drives. And with the largest 8GB NAS drives, there's a potential capacity of 72TB or, more realistically, 56TB with redundant RAID and a drive allocated for hot spare duties.

That's a huge amount of space, so I'd contest that this hardware is really designed for small businesses and not

home users – or anyone who doesn't recoil at the price of the DS916+, another £330 for the DX513 and £2,600 in 8TB NAS hard drives.

With that much space on tap organised in performance

writing across the network. While most users won't be similarly connected, at least two of them can connect simultaneously without impairing the other's highest possible speed.

> ## It delivers on so many levels for a very wide range of applications

RAID, the challenge is how that combined drive performance can be delivered to those connected to it over Ethernet.

Synology's solution is to give the DS916+ two gigabit Ethernet ports and allow them to be channel bonded to a suitable switch, effectively doubling the available bandwidth for reading and

The quoted performance level of the system is 225.83MB/s reading and 209.35MB/s in a RAID 5 layout, and nothing I've seen contradicts those levels.

In an office of 15 or so people it's unlikely that five or more would ever be simultaneously reading or writing to the DiskStation, and even then they'd get at

Highlights
- Quad-core four-bay NAS optimised for intensive tasks and encryption.
- Scalable storage up to nine drives with DX513.
- Two RAM options: either 2GB or 8GB.
- Single H.264 4K or triple Full HD online transcoding.
- Advanced Btrfs file system offering 65000 system-wise snapshots and 1024 snapshots per shared folder.
- 225.91MB/s reading, 221.04MB/s writing, or 225.83MB/s reading and 209.35MB/s with encryption.

least 50MB/s to themselves. For those with more than ten active users, there is an option to have 8GB of RAM, rather than the default 2GB, which would help smooth out the network-to-disk pathways and also allow more memory space for needy applications.

That brings us neatly to the other forte of the DS916+: service applications, specifically those relating to video processing.

Using the Intel Pentium N3710 quad-core 1.6GHz, (2.56GHz burst), this is one of the most powerful NAS boxes that Synology has built yet, and

with its associated transcoding engine, it can process either a single 4K 30fps stream in real time or three 1080p H.264 (AVC), MPEG-2 and VC-1 streams at the same time.

Plex is one of the 77 or so apps you can install, and for anyone with a serious media distribution habit, the DS916+ is fully loaded for managing your collection of video, audio and still images.

It's also one of the first NAS boxes that I've seen that supports Docker, delivering some potential for those building software containers and using virtualisation, as a development

or test environment. It works with VMware, Citrix and Hyper-V, and it's tailored to optimal performance while being operated in parallel environments.

In almost every respect, these features elevate the DS916+ to a whole new level of usefulness and flexibility that most NAS box users only dream of.

But there is one feature in here that seals the deal for this reviewer, and it's called Btrfs. Some of you will be Linux users, and to them the Btrfs file system rather than Ext3 and Ext4 is akin to the revolution that took place in the Windows world when it moved from using FAT16/32 to NTFS. It introduces cool new facilities like self-healing, snapshotting up to 1,024 levels deep, and file and folder level restorations.

Obviously, operating a file system with these sorts of enhancements has an overhead on resources, but the DS916+ is adequately provisioned as to nullify that impact.

As I worked my way through this subtly complex solution, I kept wondering what its

weakness was, but there really isn't anything obviously wrong with this design.

It delivers on so many levels for a very wide range of applications, and all without compromising its approachability to those administering it without a BSC in computer science.

I'd love the DS916+ even more if it was a bit cheaper and we could all afford NAS boxes this well engineered, but for the moment this is exclusively for the small business domain.
mm Mark Pickavance

Powerful and expandable NAS for professional use

micro mart
9 Quality
8 Value
9 Overall

Element Gaming Xenon 700 Headset

No noble gas, just great sounds

Element Gaming's top-of-the-range Xenon 700 series headset is a wonderful thing to behold. The bare metal frame, with braided wiring and a large adjustable microphone arm all speak of a product that costs in excess of a hundred pounds. Surprisingly, though, the Xenon 700 is half that price.

The design of the Xenon 700 is very good indeed. The large over-ear cups are suitably padded with a soft leather cushioned ear cup that successfully cancels out most of the environmental noise. The stitched leather headband is also equally padded and easily adjustable to maximise comfort.

We've seen a few bare metal frame headsets in recent months, where the actual skeleton of the headset is exposed. It's a style that works well, and the blend of naked aluminium against the blue and black colouring of the ear cups and leather padding adds to the design.

The ear cups are an interesting mix of LEDs, neatly wired cabling and plastic mesh. Inside each cup is a decent 50mm driver accompanied by a selection of various coloured LEDs. When the headset is plugged in, there's quite a light show, with a pulsating visual effect seen through the plastic

▲ The design isn't new, but the engineering is of a high degree

mesh of the ear cup as well as on either side.

The microphone is positioned on the end of a long adjustable arm from the left ear cup. There are two main hinged sections to bring it closer to the wearer, with a rotating section at the point where it joins the ear cup. The braided wire runs through the bare metal arm, with plenty of slack for any of its available positions.

The three-metre braided cable terminates in a single USB port. For some, this can be problematic, as the headset is now locked into USB-only

devices, but it's also quite beneficial. We've had problems in the past with headphone and mic ports being ripped out, and there are always more USB ports than 3.5mm audio ports.

Midway along the cable is the in-line remote. It's a large plastic module with volume buttons, ear and mic mute and a centre button for turning LEDs on or off.

In terms of performance, the Xenon 700 was flawless. Playing a selection of tracks from Audiomachine pushed the bass levels as well as mid-range frequencies, all of which the

Xenon 700 handled extremely well. Voice and higher frequencies were excellent too, not just in game but also for Skype calling and other voice over IP programs.

One feature of the Xenon 700 is simulated 7.1 surround sound. While there are a number of headsets that boast a feature like this, it's rarely something that works too well in-game. Thankfully, Element Gaming has managed to pitch the 7.1 effect just right. There's a clear indication of the sound placement that really expands the game audio. Playing something like *Battlefield 4* is made significantly easier, and you're able to detect and position the enemy, which means you'll never want to drop back to a standard stereo headset again. Likewise, huge orchestral pieces were similarly spectacular.

The Element Gaming Xenon 700 headset is by far one of the best models we've reviewed in recent months. What's more, it only costs £49.99, which is an absolute steal for a product of this quality.
mm David Hayward

Superb sound and plenty of great features

8 Quality
9 Value
9 Overall

iHealth Lite Scales

Keeping track of your weight has never been so easy

Digital technology for healthy lifestyles has moved on considerably since the old pedometer days. Now our phones can continually monitor the number of steps we've taken, how far we've ascended up a flight of stairs, how many calories we're burning during moments of activity and rest, and all the while keep track of every detail.

iHealth has taken the connected healthy lifestyle one step further with its latest offering as an upgrade to the standard bathroom scales. The iHealth Lite is a Bluetooth-connected scale that measures your weight and calculates your BMI (body mass index). Furthermore, through its accompanying app, iHealth MyVitals, available for both Android and iOS devices, you can log your weight and BMI progress for up to 20 different users, and if you're using the Lite with an Apple device, you can even share this information with your doctor.

In terms of design, the iHealth Lite scales are very pleasing to the eye. The scales measure 350 x 350 x 28.5mm, so they're large enough for those size 11 feet. The top is covered with a toughened glass, with a hidden LCD that's activated when you step on to it, and the iHealth logo located at the bottom.

Under the scales are four large rubber feet and a battery

▲ *When connected to the app, the iHealth Lite can keep track of your weight and BMI*

▲ *The design is pleasing, and it's quite an accurate set of scales*

compartment where iHealth has wisely already included the four AAA batteries needed to power it. The stark white design is very Apple-looking, and despite its size, it doesn't look too out of place in a bathroom.

Its accuracy is excellent, within a pound either plus or minus. It managed to distinguish between four different people accurately enough during our tests, even when two of them were mere grams apart in weight.

The maximum weight that the Lite can measure is 180kg, with the minimum being 5kg. On the hard tiled surface of our bathroom floor, the measurement tallied up with other non-connective digital and analogue scales we have, but it didn't fare too well on a carpet – even a relatively thin one – whereas the traditional digital and the analogue were within a few grams.

However, the iHealth Lite does a great job of combining your weight loss goals together with the other iHealth devices available – all through the connected app. If you're serious about achieving and retaining your lifestyle goals, then this is certainly the product for you.

Monitoring your daily weight is a great way to keep track of your health, even if you don't subscribe to the other products in the range. The added benefit of being able to share your reading to your doctor is a great selling point and one that's bound to catch on as surgeries become more connected in the near future.

The iHealth Lite costs in the region of £55, which isn't too bad for a more connected set of bathroom scales than the usual digital affairs. It looks good, it's accurate, and there are enough features available for health conscious users.
mm David Hayward

A great way to keep your fitness targets in sight

micro mart
8 Quality
7 Value
7 Overall

When standard air cooling simply isn't enough to keep your CPU from overheating, liquid cooling is the solution.

In the past liquid cooling was a laborious affair and quite messy at times. These days, though, we have enclosed units and pre-filled kits, which make things much more straightforward.

Which one is right for you?

CPU Liquid Cooling Kits

Alphacool NexXxoS Cool Answer 120

DETAILS
- **Price: £140**
- **Manufacturer: Alphacool**
- **Website: goo.gl/qd77GC**
- **Socket support: Intel LGA 2011-3, 1366, 1156, 1155, 1150 CPUs / AMD FM2, FM1, AM3+, AM3, AM2+, AM2 CPUs**

Alphacool isn't a company we've come across before, so we were fairly intrigued about what we might be unboxing, especially since this is a product with an exceptional number of Xs in the title.

This kit is aimed more at system builders who prefers a more modular approach to their liquid cooling, and it's a system you'll need to fill up yourself, rather than being self-contained.

Setting up the entire kit requires some room to manoeuvre in your chassis. With self-contained kits, you could get away with most of the individual components still in place. With the Cool Answer 120, we found the easiest solution was to pull everything out of the case, including the motherboard.

The pump head is a little odd, in that it doesn't require a backplate. Rather it attaches directly to the processor through the four mounting screws. Once that's in place, you'll attach the tube fittings, then the full copper radiator, followed by a reservoir in the 5.25" drive bay with the pump and tubing. After all, that you can top up the reservoir with the accompanying clear liquid and power everything up.

The individual components are finished to a reasonably good degree. We did find, however, that the reservoir felt a little fragile and the tubing a little too short and quite inflexible. Furthermore, the entire process was incredibly awkward and left a lot of scope for something to go wrong when we applied the power. The last thing you want is a leak or to find out you've not made good contact with the processor and the CPU water block. While the chances are slim, they are considerably higher in this case than with the self-contained or all-in-one units.

In terms of the performance of the Alphacool NexXxoS Cool Answer 120, we weren't all that impressed. The stock cooling temperature of our test i7-4790k at 4GHz was a decidedly warm 42°C. And when we overclocked the processor to 4.4GHz, the temperature rose to an alarming 74°C.

We're not sure if it was a fault in the way we built the system or whether it was just due to the kit, but the numbers still stand and they aren't too impressive. Incidentally, the 120mm fan that came with the kit made an annoying click, just slightly audible, every few thousand revolutions. As far as we could see, it wasn't hitting anything, but once the case was back together, the click reverberated throughout until it was the only thing we could hear – a small annoyance but one that could put buyers off.

Although the build quality is good for most of the individual components, we didn't really get along with the Alphacool NexXxoS Cool Answer 120. It's expensive too, at around £140 and, to be blunt, not worth the trouble and effort of setting it all up.

micro mart
5 Quality
5 Value
5 Overall

⌃ *There's a lot to take in on the NexXxoS Cool Answer 120*

Corsair H55

Corsair has built a good reputation for itself with the H-range of liquid performance coolers it has to offer. The range caters for nearly every possibility: for CPUs, graphics cards, with a pair of fans attached to the radiator or just a single fan. The prices aren't too bad either, with the most expensive coming in at around £120.

The H55 is the company's entry-level liquid cooler, which is designed for simplicity, easy fitting, low maintenance and little hassle for the user.

It's a no-nonsense setup, as it has been described in the bumph that accompanies the kit. With a tool-free mounting bracket that's compatible with both Intel and AMD processors, a pre-filled unit, low-noise 120mm fan, low-profile pump and black aluminium heat exchanger and low evaporation rubber tubing, there's a surprising amount on offer for the relatively low price of around £60.

Inside the box you get the radiator, pump, fan, mounting kits for both Intel and AMD, instruction manual and warranty postcard. All of this is neatly organised and labelled accordingly, matching the instructions, which are well laid out and easy to follow – although perhaps the

images of the individual steps could have been clearer.

The individual components are finished to a high standard. The 120mm fan is a seven-blade, 1700rpm, 30.32 dBA model, with a three-pin connector for power that will attach to the radiator where a standard output case fan normally resides.

The black, aluminium radiator measures 120 x 152 x 27mm, with a pair of 10mm rubber tubes attached that lead to the pump. The pump itself is low profile, making the H55 an ideal solution for cases where there's little room or where larger memory sticks take up a fair portion of the internal area. The bottom of the pump has a micro-fin copper cold plate, with a thin layer of pre-applied thermal paste in the centre.

⌃ It's easy to fit and can be left alone to keep everything cool

The design of the pump allows it to slot into the baseplate and retention ring perfectly, creating a secure fitting over the processor. With everything ready, the correct mounting plate and so on, the process of getting up and running shouldn't take more than five minutes. The trickiest part, in our example system, was working around the internal makeup of the chassis to fix the radiator and fan to the case output vent.

Stock performance on the i7-4790k 4GHz CPU we used was perfectly fine, measuring a mere 33°C. With a slight overclock to 4.4GHz, the temperature reached 58°C, which is reasonable. We could have clocked a little higher, but time and the fact that this was our only processor at hand meant we kept within 'normal' limits and avoided taking things to the extreme.

The Corsair H55 is a good entry-level water cooling kit. Everything is built well, and it's easy to fit and forget. If you're thinking of more extreme overclocking, though, you may need to look at the higher end of the Corsair H-series scale, but otherwise, the H55 is a good start.

micro mart
Quality 8
Value 8
Overall 8

Cooler Master Seidon 120V Liquid Cooling Kit

Unsurprisingly Cooler Master is the go-to name when it comes to total system cooling, regardless of whether that's air or liquid based. Its CPU liquid cooling options come in two main product lines: the Seidon, which we're reviewing in this instance, and the more exclusively designed Nepton series.

The Seidon series is Cooler Master's compact all-in-one, easy-to-fit liquid cooling solution – one that will fit into pretty much any PC chassis going and with either Intel or AMD chips. The Seidon 120V is the start of the range and features a 120mm aluminium radiator, single 120mm fan and a square-shaped pump with 9.5mm diameter corrugated FEP tubing attached.

This system is already primed and ready to go, and it's filled with a blend of distilled water and propylene glycol coolant. The 120mm radiator and fan are low profile, which means they'll attach to the interior output vent of the PC case without too much difficulty and without getting in the way of other internal components.

The aluminium radiator or, to be more technical about it, liquid to air heat exchanger, is similar to that offered by the Corsair H55, both in design,

⌃ *The Cooler Master Seidon 120V is good all-round cooler*

look and feel. It, like the other components from Cooler Master, are of a high quality, but we much preferred the tubing on the H55 than the corrugated FEP tubing on the 120V, despite the fact that the 120V FEP tubing is, in our opinion, somewhat more flexible than its rubberised equivalent.

The pump stands a little higher than the H55 too. Generally that's not too much of an issue, but in some circumstances there are

systems where other components tend to invade the space where a larger cooler sits. Thankfully, the 120V is still fairly small, standing 35mm from the base, so there's only going to be some clash with other components if you have a fairly unique system.

The underside of the pump has a thin copper base that, according to the technical specifications, features engineered micro-channels to maximise the liquid contact

surface. The 120V also comes shipped without any thermal paste already pre-applied, so you'll need to remember to apply the provided paste via the syringe before fitting it.

The kit comes with all the necessary attachments and brackets for both Intel and AMD systems. All you need to do is work out which CPU socket you have and fit the right screws to the right holes in the mounting plates.

Performance of the 120V was generally good. The stock cooling temperature of our i7-4790k 4GHz processor was 38°C – a little higher than the H55. When overclocked to 4.4GHz, the temperature was again a tad higher, at 60°C, but operable.

The Cooler Master Seidon 120V is a reasonably good kit. Performance was okay, and it has a good build quality throughout. The price is appealing too: the cheapest we found it was £34.99 from Scan.

While extreme overclocking may not be on the cards with the 120V, it's certainly good enough for the average user who requires a near-silent cooling system for their PC.

micro mart

7 Quality
8 Value

7 Overall

Corsair H100i GTX

The Corsair H100i GTX is classed as an extreme performance liquid cooler, with a large 240mm radiator, dual 120mm fans and an easy-to-fit solution in a single, neat package. Needless to say, it's the upper end of the H-series, above the other Corsair example, the H55.

As before, the build quality is superb. The radiator measures 276 x 125 x 30mm and features the same black aluminium cooling fins encased in a sturdy black metal and plastic case.

The dual SP120L seven-blade fans are designed to deliver high static pressure – more so than the conventional fans you'd normally find inside a PC case. This makes the entire heat exchange area efficient and surprisingly quiet too considering there are a pair of fans spinning at a maximum of 2400rpm.

Furthermore, the pump has an ace up its metaphorical sleeves in that there's a USB connection to link to the USB header on the motherboard. By installing the Corsair Link app you'll be able to control the speed of the fans, monitor performance of the system and monitor the coolant levels. You can even change the colour of the Corsair logo on the CPU pump head to either match the current LED colours of

▲ *The addition of LEDs is a nice touch, albeit an aesthetic one*

" It's quiet and does an excellent job of keeping a system cool "

your system or alternatively as a kind of traffic light warning system based on temperature readings.

The performance of the Corsair H100i GTX is really good. Our i7-4970k stock test at 4GHz saw a temperature of just 29ºC. Overclocked to

4.4GHz, this increased to 53ºC. Both are superb numbers and will offer some comfort when you start to increase the clock speeds.

Setting up the H100i GTX was simple enough – as easy as it was with the previous all-in-one system. The only

problem again was the larger radiator, but since we'd already discovered a way to fit that to our case, we didn't have any trouble in this instance.

There's not a huge amount to add in terms of the build, setup and how the H100i GTX works. The similarities between this and the other Corsair and Cooler Master systems are tiny. The only difference here really is the addition of the USB and accompanying app option – and the lower temperatures, of course.

However, the Corsair H100i GTX is a great liquid cooling solution for either Intel or AMD processors. It's quiet and does an excellent job of keeping a system cool, and we liked the addition of the LED and visual aspects. Plus it's not too badly priced either: £96 may sound steep, but considering what you get, it's worth every penny.

If your case is capable of handling the large radiator comfortably, then H100i GTX is a great all-in-one liquid cooling solution.

micro mart
Quality 9
Value 7
Overall 8

CPU Liquid Cooling Kits

NZXT Kraken X31 Closed Loop Liquid Cooler

The Kraken X31 may well be the entry-level liquid cooling solution from NZXT, but it has a wealth of mind boggling specifications. For starters, this is the world's first variable speed pump that utilises a spare USB header on the motherboard to communicate with the customised NZXT CAM software.

With this in place, you're able to control the motor pump speed from 2400rpm up to an impressive 3600rpm, while being able to view a multitude of real-time information regarding CPU and liquid temperatures, as well as helpful notifications about what's using up your system resources.

The variable pump can also be fine-tuned for situations such as performance, silent, manual selection and so on. And you can even access the controls remotely by using the mobile version of CAM for iOS and Android. It's a fascinating addition to an already great product and one that you could happily spend many minutes tweaking.

The list of desirable features doesn't stop there, however. The large 120mm fan can be controlled to a rate of up to 2000rpm while still remaining a whisper quiet 34dBA, and the 400mm of flexible tubing is certainly more than long enough for all systems, including specialised PCs.

Fitting the Kraken is simple too, with mounts and standoffs for Intel LGA 2011-3, 1366, 1156, 1150 and AMD FM2, FM1, AM3/3+ and AM2/2+ CPUs. There's even a handy online animation that walks you through the process, depending on the type of socket you're fitting the Kraken to.

Yes, this is an exceptionally high-quality liquid cooler, where every detail has been meticulously engineered. Also the black aluminium radiator offers a slightly larger than usual area to help draw heat away from the coolant, with the aid of a 120mm fan.

We were undoubtedly impressed by the NZXT Kraken X31. The long tubing made it easy to wind around the internal chassis of our test system, while still keeping maximum airflow to other components. The high efficiency of the Kraken, combined with its nearly silent operation is a must for those who put their systems through demanding overclocking or high intensity CPU tasks. And of course, the icing on the cake here is that variable speed pump and the CAM software.

In terms of performance, the Kraken didn't disappoint. Our stock temperature on the i7-4790k at 4GHz was a chilly 28°C. And when we upped the clock speed to the 4.4GHz mark, we recorded an equally cool 52°C. Even with the pump and fan tuned to the highest rpm levels, the noise levels were still incredibly quiet – compared to that of an air-cooled equivalent, at least.

The Kraken X31 is a great liquid cooler. It's perfectly fine for beginners, and even hardened overclockers will appreciate what it's capable of. At around £60, it's well priced too.

⌃ *The added benefit of the integrated software makes for a great product*

micro mart

Quality **9**

Value **9**

Overall **9**

Thermaltake Water 3.0 Extreme S

Thermaltake is certainly no stranger to the PC cooling scene. The company has been around for at least 16 years now and shows no signs of resting on its laurels.

The range of liquid cooling solutions varies from the entry-level Water 2.0 Pro kit, through to the Water 3.0 Extreme and Ultimate kits. In this instance, we have the Water 3.0 Extreme S CPU cooler on test, a highly regarded all-in-one cooler used by overclockers the world over.

Starting with the radiator, it measures 270 x 120 x 27mm and is constructed from a black aluminium mesh in the same vein as the H55 and Seidon 120V. The dual curved, seven-blade fans fit close to each other onto the radiator and provide between 1200 and 2000rpms of heat exchange from the cooling system. It's an efficient setup, and the large surface area makes for better than average cooling.

The pump head (or water block, if you prefer) can fit both Intel and AMD processors and has a large copper surface area with a small amount of pre-applied thermal paste. Like the H55, the pump head is quite low profile and shaped very

similarly. In fact, the entire setup is nearly identical, including the backplates, connections and faceplates, and it's easy to fit the pump to the CPU.

The rubber tubes are reasonably flexible and at

325mm are generally long enough to wind through most systems to the radiator placement. Speaking of which, as with the other larger radiator coolers in the group, finding the best place to mount it in our already

cramped chassis was slightly challenging.

The performance of the Thermaltake Water 3.0 Extreme S was impressive. The stock temperature for the i7-4790k at 4GHz was 30/31°C. Overclocked to 4.4GHz, it reached a reasonable 56°C. Both are good numbers, but not too far from the smaller radiator solutions we've looked at here.

We imagine the larger area of the radiator and the combined dual fans will begin to be more of a benefit when the clock speeds are ramped up again and while under stress. We didn't test this theory, but on paper it makes sense.

The Thermaltake Water 3.0 Extreme S AIO is a pretty good liquid cooling solution. It's a tad expensive at around £90, but you do get some low temperatures. The only potential problem, of course, is being able to fit the radiator in your system.

⌃ *The Thermaltake Water 3.0 Extreme S AIO is a good cooler, with plenty going for it*

> **The performance of the Thermaltake Water 3.0 Extreme S was impressive**

micromart
7 Quality
7 Value
7 Overall

NZXT Kraken X31 Closed Loop Liquid Cooler

The NZXT Kraken X31 is the best in the group for cost and cooling abilities. It's easy to fit, easy to use and will last you for as long as your PC.

The addition of the software to collect information and control aspects of the kit is a great idea and surely a draw to those who demand absolute control of their systems.

Corsair H100i GTX

It may cost just under £100, but the Corsair H100i GTX is a fine cooler with a lot going for it.

Provided it'll fit your case, it's extremely easy to set up and, again, thanks to the integrated software, you can monitor and control the water cooling system to a finer degree than normal.

How We Tested

Each water cooling system was built and fitted to an Intel i7-4790k processor, running at 4GHz. The temperature was recorded at that speed, and again when the system was under stress, playing *The Witcher 3 and Fallout 4,* and running Firefox with eight tabs, as well as Word 2013 and VLC playing an HD video. The same content was run when we clocked the processor up to 4.4GHz.

|	Alphacool NexXxoS Cool Answer 120	Corsair H55	Cooler Master Seidon 120V	Corsair H100i GTX	NZXT Kraken X31	Thermaltake Water 3.0 Extreme S AIO
Price	£140	£60	£34	£96	£60	£90
No Fans	1	1	1	2	1	2
Fan Size	120mm	120mm	120mm	2x 120mm	120mm	2x 120mm
Radiator Size	154 x 120 x 30mm	120 x 152 x 27mm	154 x 120 x 27mm	276 x 125 x 30mm	155 x 120 x 25mm	270 x 120 x 27mm
Thermal Past Pre-applied?	No	Yes	No	Yes	Yes	Yes
Stock Temp	42ºC	33oC	38ºC	29ºC	28ºC	31ºC
Overclocked Temp	74ºC	58ºC	60ºC	53ºC	52ºC	56ºC

Component Watch
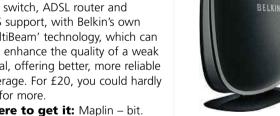
James Hunt has found some great deals on routers this week...

It seems like there are thousands of wireless routers around right now, covering all kinds of prices. If you're in the market for a new one, you can walk into basically any store and find more options than you'd ever need. To help you narrow the field, we've picked only the routers we can find that have a decent discount attached to them.

Deal 1: Belkin Surf N150
RRP: £42.99 / Deal Price: £19.99
Belkin's Surf routers are designed to offer cheap and simple home coverage, and this is about as cheap as decent routers come. This deal, available at Maplin – a high street store, no less – means you can get a reliable and consistent wireless router for less than £20. Features are standard: a four-port switch, ADSL router and WPS support, with Belkin's own 'MultiBeam' technology, which can help enhance the quality of a weak signal, offering better, more reliable coverage. For £20, you could hardly ask for more.
Where to get it: Maplin – bit.ly/1rHIDpK

Deal 2: TP-Link Archer D5
RRP: £84.99 / Deal Price: £51.99
TP-Link's range of hardware tends towards the lower end of quality and capability (and, to be fair, pricing), but the Archer D5 is a good deal whatever way you look at it. The Wireless AC implementation with dual-band connectivity supports up to 1200Mbps, and there are four gigabit LAN ports and dual USB ports to allow for storage and device sharing. As entry-level Wireless AC routers go, it's definitely worth a look.
Where to get it: Ebuyer – bit.ly/1UVvTHy

Deal 3: Linksys X3500
RRP: £99.99 / Deal Price: £85.98
As Wireless AC becomes established, high-end Wireless N routers are shedding pounds at a rate that makes them increasingly attractive purchases. Case in point, the Linksys X3500, a Wireless N750 router with gigabit Ethernet support, dual-band wireless, built-in USB port and a DLNA-certified media server. That range of features will keep any home user satisfied for a few years to come yet, and its multi-band speeds even compare favourably with Wireless AC. At £15 off, it's a great bargain.
Where to get it: BT Shop – bit.ly/1qfNcGw

Deal 4: Netgear D6200
RRP: £109.99 / Deal Price: £89.99
Another Wireless AC1200 router, the Netgear D6200 is dual-band, supports ADSL2+ and has high-end features such as built-in cloud storage and media sharing. It also has a gigabit WAN port to complement its gigabit LAN ports, future-proofing the device against faster modems further down the line. It's a strong router at any price, but a discount of this size makes it a fantastic choice for anyone looking to invest in long-term hardware.
Where to get it: Currys – bit.ly/23K6ZLp

Deal 5: Buffalo AirStation 1750
RRP: £159.99 / Deal Price: £103.49
The Buffalo AirStation 1750 was the first commercially available routers to support 802.11ac, and its current revisions mean it's still a fantastic high-end piece of hardware. Physical connectors include four gigabit Ethernet, a WAN port and USB 2.0 port, and as you'd expect for this price, it can share storage over a network. It might be notionally one of the oldest wireless AC routers around, but that doesn't stop it being packed with cutting-edge technology!
Where to get it: Ebuyer – bit.ly/1XmSY6N

The Download Directory

James Hunt scours the internet for the best freeware, shareware and paid-for application releases

This month, The Download Directory's collection of offbeat and largely undiscovered applications includes File Converter, a tool designed to help you convert one type of file into any other type of file; Pint, an update tool that reaches the parts of your computer Windows Update can't (or won't); ImageMagick, a selection of command-line tools for speedy, batch-based and automated image editing; and WinLock, a tool that prevents unauthorised users from tampering with your Windows installation or accessing certain files.

File Converter 0.7
Release Type: Open Source
Official Site: file-converter.org

Converting files between different types is never as easy as it could be, especially with things like videos and audio, where your best bet is normally to open up a bulky editing program and figure out how to do it by hand. Windows does its best to actively prevent you thinking about file types, so if you're looking to convert one into another, you need to get your hands on some software that can do the heavy lifting for you. And File Converter, while not yet completely finished, might well be the program you need to take care of it.
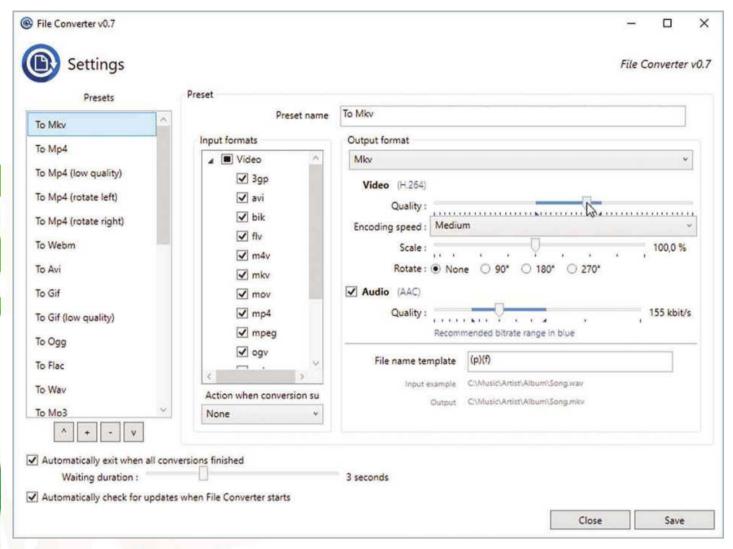
This lightweight tool adds file conversion capabilities to Windows, allowing you to quickly turn most image, audio and video files into a more easily manipulated (or smaller or more secure) alternative. The program adds options to the context menu, so all you have to do is right-click to convert and choose a destination. A variety of configuration options allow you to tune exactly how you want your output to look, even to the point of rotating it during the conversion process. Alternatively, you can stick with the default options and enjoy a simple, streamlined process with almost no dialogue box friction.

The list of supported files is extensive: there's audio import support for 3gp, aiff, ape, avi, bik, cda, flac, flv, m4a, mkv, mov, mp3, mp4, oga, ogg, wav, webm, wma, wmv, and export support for flac, aac, ogg, mp3 and wav; video input support for 3gp, avi, bik, flv, gif, m4v, mkv, mp4, mpeg, mov, ogv, webm, wmv video files, and output support for webm, mkv, mp4, avi and gif, and image input support for bmp, exr, ico, jpg, jpeg, png, psd, svg, tiff and tga, and export support for png, jpg, ico, gif. A pretty extensive list, all things considered.

Admittedly it takes a lot more in than it can put out, but that's the nature of file codec licensing. The output files tend to be in the more usable formats anyway, and you do still get the very excellent video-to-animated GIF function. We'd like to see more output formats supported eventually, but it's still early days for the program – it hasn't even reached version 1.0 yet – so it's hard to criticise it for being too incomplete. Automatic DRM-stripping would also be on our wishlist, but we acknowledge that this one's unlikely. Being able to tune outputs generally would also be nice – the per-format approach means you might end up making the same changes quite often if you have a lot of different types to administer!

Still, as file conversion programs, go it's about as good as you could want. Certainly, if you're a novice user who doesn't hold much truck with the technical fiddling your average audio or video editor requires, this is the sort of no-nonsense software you'll be able to wrap your head around, at least if it doesn't go wrong. Given that the alternatives are all a lot messier, we think it's worth giving it a fair go.

Pros: Perfect for beginners and non-technical users.
Cons: Could do with wider file support.
Rating: 5/5

Pint 1.0
Release Type: Open Source
Official Site: d.vensko.net

Windows likes to keep care of its own components when it comes to ensuring that the latest version is installed, but if you're like most Windows users, you probably aren't that interested in Microsoft's own applications when it comes to more specialised tasks. If you want to keep your applications updated, you either have to run them manually and let them check, visit the site for a download, or – perhaps worst of all – run a helper app that checks automatically every time you start your PC. Unless, that is, you employ a program like Pint to do the hard work for you.

Pint is what's known as a package manager – a program that can check for new releases and then download them for you. It runs through the command line and Windows' PowerShell as a single script, so there's no GUI and not much configuration you can do. This means the program is very small and powerful, but it's also quite hard to use – particularly if it's your first command-line rodeo. These aren't problems unique to Pint, but it's worth addressing them now because there's no guarantee this program will be easy for you to use, especially in an era of computing so far removed from MS-DOS.

One problem is that unlike similar tools, such as SuMo, Pint only works on portable versions of software. That means it's good if you want to, say, update your local copies of tools you keep on a recovery drive in case of emergency, but it makes it less good at keeping your entire system up to date. A little more confusingly, because Pint is a command line program (or at least, a shell one), you have to point it

at the files yourself and/or run a lengthy search process. Configuring the software could be a lot easier than it is.

On the plus side, it's relatively easy for experienced command-line operators to use, and if you want to add extra programs to its checks, you only need to get a few new details to add to the command line – not a huge problem at all. Ironically, we might look at it more favourably if Pint updated its software configuration itself, but it doesn't seem to do that – or at least it didn't while we were testing it.

So while it does work, we're not sure it's exactly ready for use yet – especially given its limited range. The only way we can really see it being a better option than a fully installable, GUI-based alternative is that this can more easily be run as part of scripts and other automated processes. For home users, that doesn't really make it any more attractive. We're sorry to say that the difficulty of using it and the technical complexity of configuring it really overrules any of its good points.

Pros: Very powerful and configurable.
Cons: Very fiddly with it. Zero learning curve.
Rating: 4/5

ImageMagick 7.0.1-2
Release Type: Open Source
Official Site: www.imagemagick.org/script/index.php

Although we just spent a while pounding it, the command-line doesn't have to be confusing. Indeed, if they're done right, command-line tools give you an excellent way of incorporating complex editing and transformation into automated processes, like resizing files for

```
Command Prompt                                                        —    □    ×

PINT - Portable INsTaller

Usage:
pint <command> <parameters>

Available commands:
self-update             Update Pint.
update                  Download package databases and combine them into packages.ini
.
search [<term>]         Search for an app in the database, or show all items.
installto <app> <dir> [<arch>] Install the app to the given directory.
install <app>           Install one or more apps to directories with the same names.
reinstall <dir>         Force reinstallation of the package.
list                    Show all applications installed via Pint.
l                       Show only names of installed applications.
outdated [<dir>]        Check for updates for all or some packages by your choice.
upgrade [<dir>]         Install updates for all or selected apps.
pin <dir>               Suppress updates for selected apps.
unpin <dir>             Allow updates for selected apps (undoes the pin command).
remove <dir>            Delete selected apps (this is equivalent to manual deletion).
```

upload or adding a watermark before you put them out in public. Really, ImageMagick is supposed to be for bulk-editing rather than individual editing, but that doesn't mean there's no room for the former – just that it might not be the most efficient use of your time. Like many command-line tools, this isn't about fine, individual use; it's about ruthless, repetitive operation.

The complete suite allows you to view, convert and edit graphics files. Usage is fairly easy to work with: commands are usually simple, self-explanatory affairs, like 'convert' or 'flip' and more powerful ones allow you to do things like compile multiple frames into a single animated GIF or create composite images and montages. At its most powerful, you'll be writing long, composite commands, which draw specific shapes and colours on an image, although as you can see from the screenshot (taken from the website), things can get pretty intimidating. Beginners need not apply. Experts might still want to think twice.

If you're a coder, working with the command line in this way probably makes a lot of sense, especially if you have your own program and you want to come up with a way to allow graphical operations without going through the bother of writing your own interface and tools for it. The benefit of reusing commands can't be understated either. If you had to paste a hundred watermarks onto one picture manually, you'd quickly lose your mind. Doing it with ImageMagick's tools means that in practical terms, it only takes as long as figuring out the command once. After that, you can apply it again and again.

The project is even open source, so if you want to edit the program's behaviour or even incorporate the code directly, it is possible. It's hard to call its complete inability to engage with non-technical users a problem, because unlike Pint it doesn't feel like it was ever aimed at them. No one is sitting around thinking 'I wish Microsoft Paint didn't have a front-end on it', so these tools have been engineered from the start for a particular type of use and user, which never included casual image editors.

Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can't wait for new features? Now you don't have to!

Fedora 24 Beta
getfedora.org/workstation/prerelease

Much-loved Linux distribution Fedora is gearing up for a new release next month, and that means you can now download the latest beta version to see what changes and additions you can expect – and, of course, help out in the process of finding and squashing bugs!

This beta release is code-complete, meaning all the new features are in there to be tested. Major changes to every version include an updated glibc (now version 2.23), which includes better performance, increased security, bugfixes, improvements to POSIX compliance and additional locales. The system compiler has also been moved to GCC 6 and all packages rebuilt with it, providing greater code optimisation and improved program error catching.

Fedora 24 Workstation (the one we'd expect most readers to be using!) has integrated a new, optional graphics stack known as Wayland and moves to GNOME 3.20. There have also been changes to the theming API in GTK+ 3, so it's requested that users specifically try out their favourite GTK+ 3-based applications and report any bugs.

If you want to try this new release out, you can download it at the address above in either 32-bit or 64-bit incarnations. The final release isn't due until this time next month, so there's plenty of time to try it out. It's a 1.4GB download, though, so you might have to wait to get hold of your copy, but we're confident it'll be worth it.

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The Anatomy of the Command-line • Input Filename • Command-line Options • Output Filename

The ImageMagick command-line **tools** can be as simple as this:

```
convert image.jpg image.png
```

Or it can be complex with a plethora of options, as in the following:

```
convert label.gif +matte \
   \( +clone  -shade 110x90 -normalize -negate +clone  -compose Plus -composite \) \
   \( -clone 0 -shade 110x50 -normalize -channel BG -fx 0 +channel -matte \) \
   -delete 0 +swap  -compose Multiply -composite  button.gif");
```

This example command is long enough that the command must be written across several lines, so we formatted it for clarity by inserting backslashes (\ ). The backslash is the Unix *line-continuation* character. In the Windows shell, use a carat character (^) for line-continuation. We use the Unix style on these web pages, as above. Sometimes, however, the lines are wrapped by your browser if the browser window is small enough, but the command-lines, shown in white, are still intended to be typed as one line. Line continuation characters need not be entered. The *parentheses* that are *escaped* above using the backslash are not escaped in Windows. There are some other differences between Windows and Unix (involving quotation marks, for instance), but we'll discuss some of those

ReDownloaded
This month, in our regular retrospective section, we're looking back at the May 2014 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

Hardwipe Portable
www.hardwipe.com
Reviewed Version: 4.0.3, Current Version: 5.1.4
Hardwipe is a file-shredding, storage-cleansing deletion app that works on hard drives, SSDs and memory cards and even integrates into the Windows Explorer context menu. When we reviewed it, we gave it a full five stars after being impressed by its power and simplicity, and that hasn't changed in the time since. It's packed with features, regularly updated and completely free to use. If you're trying to clean a PC before sale or disposal, it's particularly impressive.

Geo-Tag Mapper
www.it-digin.com/geotagmapper
Reviewed Version: 1.1, Current Version: ?
Geo-Tag Mapper was a program that read the metadata on a photo and then plotted your images on a virtual globe, so you could tell exactly where they were taken. Although it was feature-light, it was good at what it did. Sadly, it seems to have been abandoned. You can still find a copy hosted on the IT-Digin site using the direct URL, but it doesn't seem to be actively linked anywhere on it. It still works, but as a software project, we can probably consider it abandoned for now.

QuickMove
www.thecodeline.com
Reviewed Version: 1.5.5, Current Version: 3.0
QuickMove is a Windows extension that allows you to set up a variety of rules and behaviours that can be applied to files (for example, those of a specific type, if they're found in a specific location) to automate behaviour like moving music downloads to your music folder. When we looked at it, we found QuickMove simple but effectively executed, and the latest version is just as good as it was. There is one disappointing development, though: the price of the RegExp-supporting pro version has gone up substantially, from $4.99 to $19.99! The free version has also been cut back dramatically, so unfortunately it's hard to recommend because of the price, and hard to test because of the free restrictions. A shame.
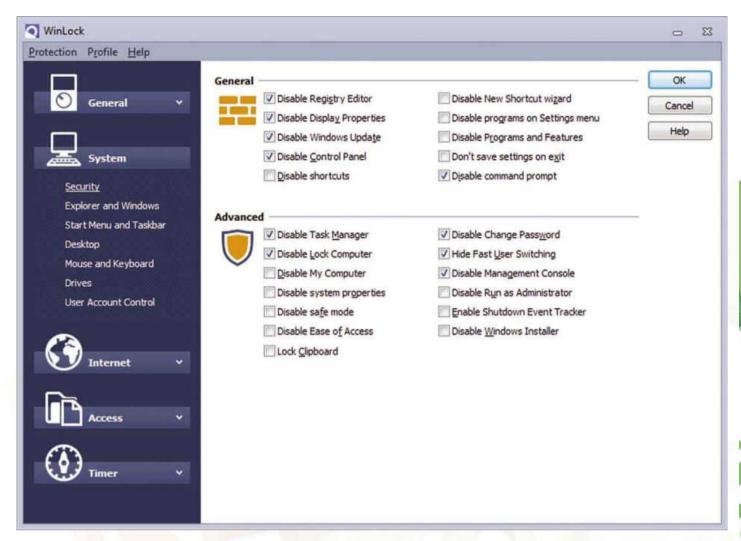
OpenELEC
openelec.tv
Reviewed Version: 3.2.4, Current Version: 6.0.3
OpenELEC is actually a build of the popular open-source media centre application XBMC, though it's an extensively reworked one to the point of being a stand-alone Linux installation designed purely to run XBMC (OpenELEC actually stands for 'Open Embedded Linux Entertainment Center'). At the time we first reviewed it, we found it versatile but complex, and we're pleased to say it's come on substantially since then. There are still lots of builds to choose from, but the software is better than ever, and you can now buy hardware boxes with the software preinstalled. Pretty impressive progress.

Of course, the flip side of this is that if you're not a developer, there isn't a huge amount here for you. Even if you do a lot of batch editing there are more user-friendly programs available. Impressive though ImageMagick's suite is, we just don't see more than a tiny fraction of our readers finding any legitimate use for it that couldn't be covered better elsewhere. It's not badly conceived, it's certainly not badly made; it's just not for us.

Pros: Easy to link with other programs and to automate.
Cons: No GUI means you'll be tearing your hair out trying to do even basic stuff sometimes.
Rating: 3/5

WinLock 7.0.2
Release Type: Trial
Official Site: www.crystaloffice.com

If you share a PC between multiple users, it can be annoying to find that they've been messing around with your files and/or Windows settings. There are built-in tools you can use to restrict user access to Windows, but they tend to assume a lot about your system and users, if they let you access their carefully hidden administrative tools at all.

WinLock is a security tool that allows you access to those kind of restrictions in a much less technical and convoluted way. You can use it to disable and / or hide a huge number of built-in Windows features that could allow people to edit your system in a way that you don't want. The number of tweaks available is huge, and the interface – just a load of tickboxes and tabs, with options organised by topic – means that if you can read and use a mouse, you can probably figure out what to do with it.

The options are protected by a central password, so it's quite easy to enable and disable them at will if you want to be able to. Options include the ability to hide system tools like the control panel or Windows Explorer, to hide certain drives so snoopers won't know they're there, and even the ability to stop people running certain applications or opening certain files and folders. You can block access to websites, even shut down the system after a specified amount of time. And if you want to be a little less strict, you can go the Big Brother route and let WinLock record every change that was made to your system and every act on it so you can operate on a trust-based system.

Essentially, if you want to lock down Windows so no one else can cause trouble on your system except you, this is the program you need. After a couple of ambiguously good (or not) apps, it's good to see one here that is working exactly as intended. The only thing we can fault is that there are so many options, they might take a long time to explore. Finding the one you want might be hard too, but they do seem to be organised fairly logically for the most part!

Ultimately, there's not a lot to say that isn't good. It's strong, comprehensive, hard to circumvent and otherwise easy to use. That's a lot of boxes ticked. The only real downside is the price: $24.95 is quite expensive for a program of this type, but if you have a need for the software, the results are actually worth paying for in this case.

Pros: Loads of options, restrictions are hard to circumvent,
Cons: Quite an expensive cost.
Rating: 4/5 mm

Remembering...
Freescape Engine

David Hayward once inhabited an 8-bit world of polygons. Some say he still does

Although our 8-bit heritage may well draw a smirk from the new generation, used to multi-core processing and gigabytes of memory, you have to admit that the developers of the time wrought some pretty impressive stuff considering the limitations.

Take the ZX Spectrum, for example. A 3MHz processor, only 30-something kilobytes of memory available out of the 48 and only two colours available per 8x8 block. But the coders of the 80s, as we all know, could wield some powerful magic, with results that were nothing short of magical.

In 1987 Incentive Software wowed the Spectrum world with its release of *Driller*. Fresh from the previous year's launch of *The Legend of Apache Gold*, made from the company's Graphic Adventure Creator, *Driller* was something entirely new. A game rendered entirely in 3D, using polygons to create an open world where the player could freely explore and interact with the environment. It was, to say the least, quite an achievement.

The game was developed using the Freescape Engine, which was then used to create the other Incentive Software titles: *Dark Side*, *Total Eclipse*, *Total Eclipse 2* and the *Castle Master* games. Freescape was a marvel of programming, an ambitious project that at first was almost abandoned due to its immense complexity for the platform it was aimed at – chiefly the Spectrum.

However, Incentive Software persevered, and through Freescape came some of the most amazing Spectrum, Commodore, Amiga and ST games ever devised.

Its History

Incentive Software was a Reading-based publisher and developer that prior to the Freescape games already had a decent reputation with its adventure titles. The previously mentioned Graphic Adventure Creator was one of its most influential and successful releases to date, allowing the user to create their own graphical adventures with relative ease.

Moving on, though, the company's next project involved a newly formed team called Major Developments. The idea was to create an engine that would have the player inhabit a true 3D world with frustums, triangles, rectangles, pentagons and line segments. There were also drivers to sense the users' position in the game world and the position of the camera, as well as any light sources.

After 14 months of development, *Driller*, the first game using the Freescape engine, was ready for release. Despite the crippling frame-rates that the polygons were being shifted around the screen at, *Driller* was positively received by the media and public – scoring a 97% overall

in Crash and earning the coveted Crash Smash award.

Of course *Driller* was just the beginning. The engine was then tweaked and ported to the Amiga, ST and even the PC – all of which were far more powerful than the 8-bit machines.

The tweaking of the engine proved to be even more successful than first imagined. *Total Eclipse*, set in an Egyptian pyramid in an Indiana Jones-type exploration adventure, saw the Freescape Engine take on multiple tiers and even the introduction of spheres. The performance was improved greatly too; even the old Spectrum (it was 1989 when *Total Eclipse* was released) could keep up with a speed increase of up to 10% over its predecessors.

By the end of the early 90s, the magnificence of the Freescape Engine was beginning to lose its lustre, with the PC now producing better-quality 3D games. Incentive Software, however, had one more ace up its sleeve. The company released the entire engine and its development tools as the 3D Construction Kit, so users could create their own Freescape-based games. **mm**

Did You Know?

- Incentive Software had such a struggle finding developers for the Freescape Engine, as it was deemed impossible at the time.
- Freescape eventually evolved into Superscape, and the company changed its name to Dimension International, aiming for the commercial market instead of gaming.
- FCL was the scripting language behind Freescape, whereby you could include interactive elements.
- A remake of Freescape is freely available on GitHub.

▲ *Driller on the Spectrum: the first Freescape Engine game and what a corker!*

▲ *Total Eclipse on the PC. It may look its age, but it's an amazing game nonetheless*

RETRO ROUND-UP

The retro games keep coming, but more modern ones are disappearing… and Dave Edwards doesn't like it one little bit

It's a truism that more people are into the 'best' retro games on their format of choice, than the 'new' games for that format. For example, my girlfriend has a Sega Mega Drive/Genesis emulator on her PC to replay the odd game of *ToeJam & Earl*. My sister has WinUAE installed almost entirely to try and finally win *Superfrog*. That's because they remember the retro games they played in their youth, but someone (like me) has to actually draw their attention to the 'new' games that are constantly coming out.

This month we've got another detailed look a selection of 'new' retro games, but before we dive into them, I've got something pressing to get off my chest. In the latter stages of my own youth I had a first generation iPod Touch. I bought and downloaded a great game for it called *DJ Mix Tour* by GameLoft, on which I spent more hours than the rest of my downloads combined.

Recently, I dug out my old iPod Touch and connected it to my newest PC, on which I had the latest version of iTunes. Said software, for some unknown reason and without any warning, immediately erased my treasured *DJ Mix Tour*. Somewhat miffed by this, I went looking for it in the Apple store to download it again, but I couldn't find it. So I ventured into some of the more dubious places on the Internet, wondering whether I could find a pirate version to replace my legitimately purchased one instead; I was out of luck. Apart from a very old video review of someone playing it on YouTube, and a few screenshots

on an archived page, *DJ Mix Tour* – and all mention of it – seems to have disappeared.

What's more startling to me than the loss (and how iTunes is to be distrusted), is that the game was only released 2008. If a relatively modern game now disappears within seven years, one really has to wonder how successive generations will replay their 'old' retro games at all! In my naivety, I assumed that there would be an online archive of iPod Touch games for the older iPod Touch generations. I was wrong. There isn't even a simple list of what games work with what generations of iPod Touch.

DJ Mix Tour is far from the only 'lost' game either. I can't find any trace of some of the games my iPod Touch still retains, and they're big name titles: *Silent Hill: The Room*, *Terminator Salvation*, etc. Where have they all gone?

There are plenty of new games for the iPod Touch that won't work on the First Generation model, but I can't find the old ones that will. All this begs two questions: will future generations will be able to play the retro games of their youth at all, and will computer archivists eventually be trawling car boot sales for for old, unformatted hardware rather than physical tapes and disks?!?

That's something to think about if, like me, you've got an older iPod Touch that you one day consider junking (or indeed plugging into a modern computer). The evidence is that *DJ Mix Tour* for the iPod Touch is now harder to find than *Rule Of Rose* for the PS2…

▲ *DJ Mix Tour: Wherefore art thou?*

Phantomasa 2 (tinyurl.com/jhe2z4p)
Spectrum 48K/128K, Silver Games Studio
£5 plus P&P

Herr. Phantomasa is a creation of the Mojon Twins, who have written more Speccy, Amstrad, MSX and retro-themed PC games that I've had hot dinners. Mind you, the Mojon Twins also created the utility La Churrera – which has succeeded in allowing almost everyone to be able to create their

▲ *128K version of Phantomasa 2, also on ZX Vega*

▲ *The Euros are your target*

▲ *Very colourful*

▲ *"Hello, reader, I want to play a game…"*

▲ *That tap (top right) will be a cinch, right? Wrong*

▲ *And you thought the stairway was tough before!*

own platform games and reduced all 'new' Spectrum platformers to being much of a muchness. Indeed, I've lambasted quite a few of them right here (*Zombie Calavera* in MM1350, and *Lala Prologue* MM1354, for example) and am always a bit worried that, when a new one comes along, any review will simply be a regurgitation of the same old complaints.

However, I'm happy to report that *Phantomasa 2* isn't a bad little caper at all, which may explain why it's just been given a physical release on the Silver Games Studio label (through **www.sellmyretro.com**). The instructions are the usual over-complicated verbiage, but the game itself is a colourful meander through fifty screens of fun, where you must grab the moneybox from each one.

I don't propose to go too far into the dynamics of this game, but suffice it to say that there are the usual three controls – left, right and jump – and that your hero will jump further if you are able to take at least a short run-up to whatever obstacle you're trying

to leap. *Phantomasa* has an energy level, depleted by the usual playing mistakes.

A typical room contains two floating nasties plotted in a random position when you enter, which then gravitate slowly towards you. Although this works as a concept, I find this to be somewhat 'lazy' design for a game. Whether or not you can grab the money and escape the room without colliding with one or other of them is pseudo-random. Unless, that is, you keep exiting and re-entering every room several times to get them in a position whereby you know (from previous plays) that they can be avoided.

The game is very responsive, however, and in addition to the money, objects appear (also at random) to give temporary invulnerability or top up your energy levels. Alas, collecting invulnerability causes *Phantomasa* to flicker very quickly, making him extremely difficult to position.

There are two versions of *Phantomasa 2* on the cassette, and each is different enough to qualify as a game in its own right. As there are no graphic adventure elements, all you need do is "stash the cash", meaning neither game is difficult. In learning how to complete each room, you will get a little bit further each time you play until you eventually succeed in amassing all the swag.

The 128K version of *Phantomasa 2* is also included on the ZX Vega.

Jet Set Willy: The Nightmare Edition (tinyurl.com/jxbkpyn)
Spectrum 48K/128K, JSWMM Community
Free

Jet Set Willy: The Nightmare Edition is a new game for the original Spectrum 48K. It's been over a year in the making but, right off the bat, I must confess to finding this is the most terrible version of *Jet Set Willy* I have ever played.

To cut a long story short: the *Jet Set Willy/Manic Miner* Community have taken this classic and edited it, ramping up the difficulty. Why it would do this, however, is

▲ *Watch your step!*

somewhat lost on me personally, though. I appreciate that a community that totally revolves around *Jet Set Willy* might see the value in making a new *Jet Set Willy* game, and that making a more difficult version of the original is one path to that which hasn't actually been tried before.

I'll venture I know why, though: most people love the original. They love playing it on their iPhones, or their new blue-toothed Spectrum keyboards, or on their PC, or on their MSX Beecard imported specially from Japan. And I would venture the reason the original game is so well-loved is because how to get through quite a lot of the original screens was permanently imprinted on their brains all those years ago. They want to finish the game off – even if it's hard and it is going to take them a lifetime.

This version takes all of the fun of that away. As an example, well look at the very first screen (the familiar bathroom). Traditionally, Willy begins the game next to a flashing tap – the first of many objects he must collect in order to win the approval of his housekeeper (and then be allowed to retire to bed) – however, in the nightmare version, there is an additional tap located in the top right of the screen. To get to that tap requires Willy to venture into a corner of the bathroom that, in the original, he didn't need to. That means a jump over a patrolling pair of nutcrackers. Try it, however, and Willy will die – because

▲ RetroWorks' releases are visually awesome

▲ Every game comes with a backing track by Sanna Nielsen...

▲ ...called "Empty Room". Not really

a totally invisible deadly block is situated in exactly the area Willy's head will collide with!

This illustrates exactly the point of *The Nightmare Edition*. The idea is that players go to collect the items, instinctively imagining that the game will behave in a certain way because of their familiarity with the original. The game then kills them off, or throws them into a state of confusion by having invisible obstacles, or obstacles slightly moved from their positions in the original.

There are only two new rooms; others are just murderously difficult versions of the original ones. New obstructions litter every room, making even crossing previously easy rooms (by just walking across the bottom of the screen) an exercise in hair-pulling and expletive-roaring. Playing *The Nightmare Version* is like playing a game where you can set the level of difficulty before you start – while I would say the original was already set at 'Hard', this is set at 'Insane'. Get the idea? Still feel like a play? No, thought not.

Jet Set Willy: The Nightmare Edition is the most demoralising game I've played this year. The vast number of developers involved in its production only serves to highlight that the closer you are to a project, the less you are able to see the bigger picture. The sad fact is that the only audience for this monstrosity is the very team that has put it together, while 99.99% of people will continue to prefer the original.

There are some little inclusions that did something to abate my ire – but not by a lot. There are three new pieces of music to be found in relatively accessible rooms. They fit perfectly with the scenario and are a welcome inclusion. There is also some feeling of satisfaction when you do (against seemingly impossible odds) work out exactly how to collect a particular item. The uplift in lives is, naturally, welcome, although the 'repeating death-loop' of the original is still present on some screens (Entrance To Hades being one of them),

meaning they just take longer to cycle through if you're unlucky.

I suppose you could say: "Hang on, put yourself in the mind of someone who is madly in love with *Jet Set Willy*. They've played every variant they can, and every unofficial sequel with all its new rooms. Just perhaps, then, they might find *The Nightmare Edition* to their liking and maybe even think it's the best thing since sliced bread?"

The trouble with that argument is, however, that I am such a person. I have played every variant of it, I have played all the unofficial sequels. I've even played many clones that used *Jet Set Willy* as their unofficial inspiration. Many of them I loved, and strived to conquer.

Yet, after an hour of playing *The Nightmare Version*, not only did I never want to see it again, I felt almost complete despair about the community that had, with such finesse, put it all together without realising there will be zero audience for it. It seems to me they've wasted not only their own time, but also the time of anyone who downloads the thing.

Vade Retro (tinyurl.com/z3afxto) (Spectrum 48K/128K, Retro Works £9.95 plus P&P

If you're an evil sorcerer with the power to zombify at will, you probably think the town's blacksmith isn't going to give you a lot of trouble. That's certainly what Senor Delcram thought when he started throwing his orb around zombifying the eastland inhabitants of Ye Olde Dysarlyn. He was wrong in a big way because, like a cross between Clint Eastwood and Steven Seagal, the town's blacksmith forced Delcram into a seriously quick retreat. The blacksmith returned to his quiet life assuming his adventure was over – but no, not quite. Delcram is, apparently, back.

In *Vade Retro*, you become Eshur the blacksmith. Your task: Get your sword back, anoint it with poison, collect a few skulls for good luck, find Delcram and finish him off.

And so begins a rather nice "old school" platform graphic adventure game for the Spectrum 48K/128K.

Vade Retro feels like it belongs right back in 1984. Not that that's bad; it just doesn't offer anything particularly unique. *Dizzy*, *Finders Keepers* and *Palace Of Magic* have already set the gold standard here; *Vade Retro* feels like it's only aiming for silver.

You walk from one room to another, flick-screen style, passing an array of gorgeous graphics, including unfurled heraldic flags, stained glass windows and crucifixes. Exploring your surroundings you'll find forests, villages and dungeons, all the rooms being well themed. The playing area also wraps around on itself, so you don't need to retrace your steps as often as you might expect. What most of these rooms have in common however is that they're almost deathly quiet. One bouncing spider if you're lucky. Hmmm.

Your first mission is to collect four 'seals' that open the dungeon door. Two are easily located, the others are in the battlements of a castle. Leaping into this area, you find yourself chased by a monster – who floats in, either from the left or from the right, directly toward you. Entering and leaving the room gets rid of him but, after a brief pause, he appears again – a heat-seeking missile which will inevitably get you in the end as you struggle to progress over the platforms from the room's entrance to its exit.

There's something a little depressing about the whole mix herein. It also falls into some familiar Spectrumesque traps, with colour clash being very apparent. Walk in front of a white wall and Eshur turns white, in front of a black background he goes back to yellow. It's also never a good idea to plot small red patrolling nasties on the roofs of red houses; still less to force you to blindly jump from the roofs from one room to another.

There's barely any sound in the game itself, apart from a blip when you jump or lose energy. On top of that, the instructions

↑ You are banished, so you're the one in the bubble…

↑ The ropes are a little too high for our friend

↑ "I'm the gnicest work of gnature in the zoo…"

say Delcram has succeeded in enslaving or killing everyone but you, so you only really seem to be fighting to live a life of eternal solitude anyway. Talking of which, you have a single life with an energy bar that can be replenished by collecting the skulls.

On the more positive side, this is reasonably challenging. It's difficult at first to avoid the floating monster things; it does get easier with practice. Eshur is also well-animated and responsive. I liked the way you could control your jumps in mid-air. I also liked the polish of the loading, opening and game over screens – and the way each seal you collect lights up in your inventory at the bottom of the screen. You do feel a sense of achievement when you complete each of the tasks, which goes some way towards alleviating the emptiness of the rooms themselves.

As I said above, *Vade Retro* isn't a 'bad' game. It was actually released as a free download about eleven months ago, and I did play it at the time, but its publisher Retroworks has now decided it deserves a physical release and a limited number of cassettes are now available at €10 each. Both its cover art and on-screen language are English, but it's

definitely 'English written by a Spaniard'. I had to pretty much mentally rewrite its instructions, sifting through all their irrelevancies to get to the point of how to play.

The care that goes into the finish of Retroworks' releases is always second to none, however, and Vade Retro comes in a lovely fold-out cardboard box, similar to the impressive 2014 Spectrum 128K game *Brunhilda*. Alas, it's not as good as that beauty (which some consider to be the best Spectrum game of all time), but it will probably garner a fair amount of interest on the back of it.

A great backstory, graphics and physical presentation, but a fairly mediocre platform game where the number of empty rooms lessen the excitement of the original premise.

Retro Find Of The Month:
Imogen (tinyurl.com/z5qttea)
PC (Windows), Ovine By Design
Free

Yes, it's another retro-themed PC game! *Imogen* is a puzzle game in sixteen sections, originally released for the BBC Micro in 1987 and ported, some sixteen years later, to the PC. In the game you play a wizard who has begun to trouble villagers by howling at the moon and insisting he is referred to by a girl's name. Their entirely reasonable reaction has been to seal him up in a warren of caves that can only be conquered by pure logic.

Released by Ovine By Design, who also wrote *Exile 2: The Nameless* (See MM1410), this new version of *Imogen* is a reimagining of the original; it retains all of the elements that had us scratching our heads in bewilderment throughout 1987-1988 but updates the graphics, sound, colour and animation. It also introduces an 'attract mode', which parades all the different cartoon characters featured in the game.

The game itself is a side-on, flick-screen platformer. You initially have control of the beardy-weirdy wizard, but you may use the cursor keys to transmogrify into either a cat or a monkey. The cat can jump the furthest,

the monkey can climb the ropes and the wizard can hold and manipulate objects. A typical cave contains four screens in total, inhabited by a number of additional cartoon characters. For example, climb the ropes to collect a whip. Crack the whip at a dog to back it up into a corner allowing access to a room with a frog. Change into the cat to reach the frog, change into the wizard to pick it up, and squeeze its belly to open up the door to another screen.

Being a remake, the puzzles are identical and some of the frustrations of the original have come back too. Z, X and ENTER operate whatever character you are, but remembering to use Cursor Left, Cursor Right and SPACE to highlight and select the desired animal is trickier than it at first seems.

Secondly, the cat seems to suffer from a variable jump control; he jumps further with something of a run-up. This rather important feature – crucial to solving some of the puzzles – hasn't made it to the instructions, however.

Thirdly, the monkey climbs the ropes but does so is a non-intuitive way. You hold down the 'fire' key to ascend them at one speed, whilst releasing it will cause him to fall at a faster, different speed. You also cannot change direction whilst jumping. While, some might argue that these frustrations are part of the game's pull factor, I'm not one of them.

The game features very nice touches – the animation of Imogen being cast into his prison, and what happens when you click the "X" to quit it being just two of them. All told therefore, this is quite a remarkable remake – it has managed to retain all the features of the original whilst delivering a game that is modern and very appealing to all.

Adieu To You
That brings us to the end of another fascinating glimpse into what's new in the world of the old. As per usual, follow the tinyurls for videos, downloads, instructions and trivia galore. Until next month, then. **mm**
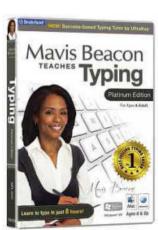

Vade Retro
Graphics 80%
Sound 10%
Presentation 65%
Value For Money 50%
Overall 51%

Imogen
Graphics 90%
Sound 90%
Presentation 90%
Overall 90%

What's Your Type?

If you have to look at your keyboard every time you type a letter, then these touch-typing programs and games are what you need

Whether you're a journalist, a programmer or just a school pupil doing coursework, having the ability to touch type can be a real game-changer. Of course, what you write matters more than how you write it, but if you're not wasting time with an inefficient two-fingered search-and-peck typing system, then that's time you can better spend on research and fine-tuning your work. It also means there's less of a gap between when you think something and when you type it.

Yes, without doubt, being able to type quickly and effectively is a huge advantage in many professions. And for students, it's become increasingly necessary, with

▲ *Mavis Beacon remains one of the most well-known typing programs*

▲ *Typesy's Chrome app makes it an appealing prospect, but you'll need to pay to get the most of out it*

handwritten essay submissions now a thing of the past, and programming courses gaining popularity.

Yet, for some reason, it's not a skill that's taught in most schools. As you'd expect, there's plenty of focus on handwriting (as there should be), but touch typing lessons are a rarity. This is strange, considering that for many adults, keyboards are our primary way of putting down our thoughts, and we rarely pick up a pen, unless it's to jot down a few notes.

The weirdness of this situation is compounded by the fact that it's not even particularly difficult to grasp the basics of touch typing. There are many typing tutor programs you buy cheaply, and there are even some decent ones you can pick up for nothing at all.

It can also be fun too. Many typing applications also include simple games, which reward you with points or destroy enemies for typing words as they come up on the screen. Plus there are dedicated typing games, which mix typing with more traditional gaming genres.

If you're one of the many people who's reached adulthood without being able to touch type, this guide is for you. We're going to look first at standard typing tutors, before moving on to the fun stuff.

Typing Tutors

There are plenty of programs available that teach you how to type, and they generally have a few things in common. For a start, although some do support alternative layouts, they generally teach you how to type on a standard QWERTY keyboard. They do this by getting you to type out the words they show on screen, which is accompanied by an image or animation that instructs you on which fingers to use for each letter. What differentiates them is the quality of the exercises, the statistics they gather about your abilities and extra features like games.

For the sake of space, we're only going to cover a few such programs here (starting with a very familiar name), but there are loads more, many of which are free.

Mavis Beacon Teaches Typing (mavisbeacon.com)

The supreme ruler of all typing programs, Mavis Beacon might not be the best typing program in the world, but it's certainly one of the most well known. First released in 1987, this range of applications is known largely for the titular Mavis Beacon, a pretty young woman who adorns the front of every box. Obviously, whoever she is, she must be an amazing typist, right? Maybe, but she certainly isn't a real person. Instead, she's a fictional character, played by a model named Renee Lesperance (you can read more about this at **goo.gl/rR012e**). She also seems to be portrayed by a different person on new versions of the software.

Regardless of who Mavis is, though, the program itself has plenty to offer in addition to a pretty face. Available for Windows and Mac OS X, there are a few different versions available, from a wide selection of retailers, with prices ranging from as little as £3 up to about £40. There's also a version created for children, called Mavis Beacon Keyboarding Kidz (presumably, the person who named it mistyped 'kids').

Whichever version you choose (other than Kidz), you'll find Mavis Beacon to be a more than competent typing tutor, which promises "Proven positive results in just 8 hours". The program sets you goals, gives you exercises to complete and even comes with a range of simple games. Like many other typing tutors, during lessons you see an on-screen keyboard, complete with a set of hands, so you know where your fingers are meant to

be and which ones you should be using for each key.
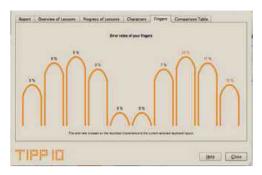
Be aware, though, that some earlier versions only support QWERTY keyboard layouts, so if you use or want to learn the Dvorak layout (see boxout), make sure you buy a version of the program that supports it.

Typesy
www.typesy.com

Formerly known as Ultimate Typing, Typesy is available for Windows, Mac OS X, iOS and even the Chrome web browser. Not only does the Chrome version potentially enable users on Linux and other platforms to use Typesy, it also lets anyone try the program for free without committing to a purchase of the full version. That costs £17 and includes installations on unlimited computers for up to five users, unlimited cloud services and unlimited free updates. This is great, apart from the fact that it only gives you three years of access. We'd much prefer a straightforward purchase of the software, but you could argue that you probably won't need three years to learn now to type anyway, and after that you'll never use this software again.

We checked the free version, and it's very limited, but it does allow you to practice the basics of touch typing. The app is broken into various sections, such as accuracy training, speed training, keyboard training and typing fun (games), and in each section, the first exercise is free. There are also a range of preset courses, with the beginner's course being the only one available for free. You can

▲ *UltraKey has plenty of customisation options*

▲ TIPP10 is completely free, and it's not a bad typing tutor

also see your stats, which consist of typing speed, accuracy and the amount of time you've been training, and you can set yourself speed and accuracy targets too.

The actual training itself is fairly well presented. You're first shown a video, in which a presenter introduces the concepts you're about to learn, then you're given a list of words to type, with an animated picture of hands on a keyboard to indicate which fingers you should use.

This is all fairly standard for typing software, but the Chrome add-on gives Typesy an extra layer of usefulness, because you're able to practise using your own account, no matter where you are. Bearing this in mind, the three-year licence shouldn't be too much of an inconvenience.

UltraKey
www.bytesoflearning.com/
Available for Window and Mac, UltraKey comes in at $39.95 (roughly £28), which puts it at the higher end of the price range for home typing software. For this, you get a licence for three installations and a choice of US, UK and Australia/New Zealand editions. There's also an online version, which uses HTML5, but this is aimed at schools and businesses, rather than personal users. Indeed, much of the UtraKey range is based on this business model. It's a shame, because it means regular users can't access cloud saving functions or a version for web browsers. Thankfully, UltraKey makes up for this by

being a competent and accessible typing program.

As you'd expect, you can track your typing speed, set targets and so on. And you can see a virtual keyboard, complete with hands, to see if you're typing with the right fingers in the right places.

With such a focus on education, though, don't expect to find any games, but do expect to find well-paced exercises, in-depth reports on your typing and good-quality instruction. Indeed, this aspect of the program is so good that newer editions of Mavis Beacon are "Powered by UltraKey".

If you want a straightforward typing tutor without any of the frivolity, this is a decent option for sure.

TIPP10
TIPP10 isn't the most advanced typing tutor in the world, but it's notable for being completely free and available for Windows, Mac and Linux, and the online version increases its versatility further.

When you open the application, you're shown some text, which explains where to place your fingers, and each of the keys in the home row ('A' through to the semi-colon) is colour coded. This colour coding continues into the exercises themselves, which replaces the animated hands you'd see in other programs. Supporting this, the names of the fingers you're supposed to use are displayed at the bottom (e.g. 'Left little finger'). This is sufficient, but it isn't anywhere near as useful or intuitive as an illustration. Still, it's a free

program, so it's seems unfair to criticise it too much, especially as the exercises themselves are perfectly fine, and the feedback you receive is good too. Not only can you see your speed in characters per minute and the amount of errors you made, you can also see your best and worst keys and the error rates of each of your fingers. These aren't unusual features, because you'll find such things in most paid-for typing programs too, but they're not always found in free ones.

Unfortunately, there are no games and only 20 typing lessons, but this program should still be enough to help you grasp the basics of touch typing without you having to pay a single pound.

Typing Games
Finding typing games online is easy, but most of them are simple Flash games that amount to little more than typing exercises with simple animations, like popping balloons and so on. Even more graphically impressive Flash games don't offer much interaction, either if they do look better. The main challenge from such games tends to be choosing which word to type first, depending on, say, which enemy is closer to you.

Full PC games, however, have much better production values, which generally means they also offer more game-like features.

The Typing Of The Dead: Overkill
Anyone who's ever frequented a games arcade will have seen or played one of the *House of the Dead* games. The original *Typing of the Dead* took the *House of the Dead 2* and replaced the lightguns with a keyboards. And although you might think it was a PC

▲ There's nothing zombies hate more than people typing words really quicky

▲ *Epistory: original, beautiful and genuinely fun*

release first (coming out in 2000), there was actually an arcade machine first that came complete with two full-size keyboards.

The Typing of the Dead: Overkill is based on the later (and much more sweary) game *The House of the Dead: Overkill*, which was first released on the Wii in 2009. Just like the other *Typing* games, it's an almost exact copy of its source material, but each zombie has a word attached to it. As you type each character of a word, you 'shoot' that zombie. Don't do it fast enough and you get chomped.

As an on-rails game, though, interaction is inevitably limited. You can choose which zombie to type to death first, with the border around words going from green to red as they approach and become more of a danger. But essentially, it's the same kind of gameplay as balloon-popping Flash games but with fancier graphics.

Does that mean it isn't fun, though? Not at all. The presentation of the *Overkill* is what makes it enjoyable, and if you don't mind bad language and puerile humour, it can be quite amusing as well. It won't teach you how to type, but provided you already have some basic skills in this area, it can certainly help you to gain more speed.

Epistory - Typing Chronicles

Possibly the best typing game ever, *Epistory* mixes RPG and action elements with typing to produce a proper gaming experience and a challenge mode that will keep you coming back for more.

Graphically, the game's world is based on origami, with new parts of the environment 'unfolding' as you progress. Weaved into this is a literary theme and a beautifully delivered voiceover. And unlike other typing games, Epistory isn't on rails; you're free to explore this world as much as you like, using either the WASD keys, arrow keys or a more typing-friendly layout. As enemies approach, you can choose to run away, or you can tap the spacebar or Enter to go into attack mode. Once you do this, words then appear on your enemies, which you type to banish them.

That sounds simple enough, but as you progress, not only do the words become longer, you also have to deal with enemies that have to be killed with a particular power. This means typing in 'fire', 'ice', 'spark' or 'wind' before typing in the relevant words, which will activate these powers, each of which has its own properties. Fire, for example, will burn the next word when enemies have more than one word to type, while ice will halt them in their tracks momentarily.

In short, it's a proper game, with experience points, upgrades and more. And once you've completed the story, you can spend time in the arena mode, which consists of a few different on-screen environments, in which you'll be bombarded with limitless enemies. Your high scores are then submitted to a global leaderboard so you see just how pathetic your 30 words per minute are compared to the top typists in the game (but don't let that discourage you; just try to beat your own record).

Quite simply, an excellent typing experience, even though it doesn't actually offer any form of typing tuition.

Like any skill, typing takes practise, and shorter, regular sessions are probably better than a sporadic, intensive ones. But from our own experience, you really can pick up a fair bit of speed and accuracy is just a couple of weeks. And even if you're only going to be typing emails and Facebook posts, it well worth it for the time you'll save later.

Happy typing! **mm**

Top 10 Photos Tips

The Photos app in Windows 10 is perfect for browsing your snapshots, sharing and editing. Roland Waddilove presents his favourite tips

1 Browse Collections

If you want to browse all your photos and see them arranged in chronological order, select 'Collection' in the left panel. At the top is the month, and below are photos grouped by the dates they were taken. Spin the mouse wheel to scroll up and down through the photos.

The month is a clickable link, and it displays a list of months and years. You can quickly select another month or spin the mouse wheel to scroll the list and go back several years and select a month. This is a quick way to jump to photos from years ago without having to scroll through them all.

2 Apply Bulk Actions

In Collections view, click the Select icon in the top-right corner of the Photos app. Tickboxes on the photos are used to select them. Explorer tricks do not work here, so you can't lasso multiple photos, and you can't click one then Shift+click another to select all those between. What you can do is click the Select link above a day's photos. So if you had a number of photos taken on 10th April, you could select them all with one click. After selecting photos, icons appear in the top-right corner enabling you to copy or delete them all with one click.

3 Share Your Photos

Your photos can be shared on social websites, in emails and instant messaging straight from the Photos app. This is a great way to show off your latest snapshots to friends. Select one or more photos and then click the Share button that appears in the top-right corner of the app window.

This opens Windows 10's sharing panel on the right side of the screen. The options that appear here depend on the apps you have installed. If you have the Facebook app, then you can post the selected photos on Facebook; if you have Twitter, then you can include a photo in a tweet; and you can send photos using the Mail app or Facebook Messenger and others if you have them.

4 Share Photo Albums

In addition to sharing photos on social sites, you can also share whole albums on the web. Select 'Albums' on the left and then click an album to open it. Click the Share button at the top of the window or below the last photo in the album. Photos offers to upload all the photos to OneDrive and then creates a shareable link that you can give to people or post on the web.
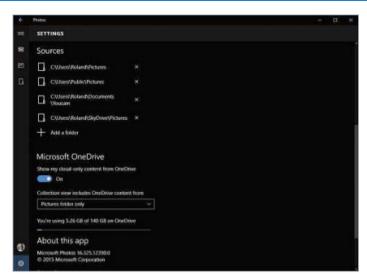
5 Automatically Enhance Photos

Photos can automatically enhance poor images to make them look better. This has the advantage of showing your snapshots in the best possible way. This is great when you want to show them to friends. However, the enhancements are not saved, and you don't see the photos as they really are. If you want to use the editing functions, you should turn off the automatic enhancement feature so you can see which photos need enhancing. Then select and edit them.

Click Settings at the bottom of the left panel and at the top either turn on or turn off 'Automatically enhance your photos'.

⌃ *Select multiple photos in Collections or Albums view for copying, sharing or deleting*

⌃ *Select one or more photos and share them with friends on social media*

⌃ *Add folders to Photos to include them in the albums and collections*

⌃ *Apply filters to photos, save them and then apply more to create effects*

6 Customise The Tile

Many Start menu tiles can display live information, and Photos is no different, but you can choose what is displayed. Right-click the Photos tile on the Start menu and select Resize > Large so there's space to show a photo. Then right-click it again and select More > Turn on live tile.

Open the Photos app and click the settings icon in the bottom-left corner. Under Tile, choose either 'Recent photos' or 'A single photo'. If you choose the second option, click the Select photo button below and find the photo you want to show on the Photos tile. The Recent photos option makes a mini slideshow on the Start menu tile.

7 Add Folders

If all your photos are in the Pictures folder, the Photos app can find and display them. What about photos stored elsewhere, such as other folders on the disk, another partition or USB drive? To enable the Photos app to show the images in other locations, go to Settings and click the plus button under Sources. Find and select the other folders containing images.

Below the Source section is OneDrive and it's particularly useful to turn on the option to show pictures stored in your online storage. Get the OneDrive app for your iPhone or Android phone and turn on the option to automatically upload photos. Each photo you take on your phone is automatically uploaded to OneDrive and then it appears in the Photos app on your PC.

There's an option in the OneDrive section to show photos from the Pictures folder only, which is where your phone uploads photos, or to include images from all folders on OneDrive. This is up to you.

8 Fix photo Faults

If there are flaws in some of your photos, such as bad lighting, poor contrast, washed out colours and so on, they can be fixed in Photos. Click a photo in a collection or album and then click the pencil icon at the top. Select Basic fixes on the left and Retouch on the right. This tool is used to erase unwanted items in photos. It won't remove large objects, but it works with small ones, such as wrinkles on a face – a tear or scratch in an old photo, for example. Let the mouse hover over the area for a second and then click the mouse button. This is a bit hit and miss, but if it doesn't fix the fault, press Ctrl+Z to undo the action and try it again.

Also in the Basic fixes section is a straighten tool for correcting a tilt in the photo caused by the phone or camera not being horizontal. Select the tool and then click and drag the white circle around the circle. A live preview shows the result, and
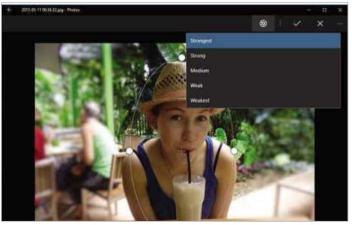
the overlaid grid helps you line up vertical buildings, horizontal horizons and so on.

Red-eye, the effect caused by a camera flash reflecting off the back of someone's eye can be fixed in Photos. Click a photo, click the pencil icon to enter edit mode, select 'Basic fixes' on the left and 'Red eye' on the right. Use the plus button in the bottom right corner to zoom in on the eyes, and click the tool on the red. This reduces it and makes the eyes more natural.

9 Apply Filters
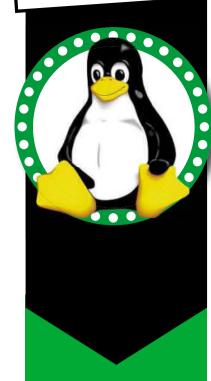
Click a photo to open it and then the pencil icon to show the editing tools. Select Filters on the left, and on the right is a strip of thumbnail images. Each has a slightly different effect, and you can click them to apply them. There aren't many effects compared to some photo editors, but they are easy to experiment with. Always use the Save As icon at the top to save the modified image as a new file and keep the original photo unchanged.

10 Selective Focus

This effect can be used to keep the subject of a photo pin sharp while blurring the background. This is particularly good for portraits where you're focusing on the face and the background is irrelevant. Click a photo, click the pencil, click 'Effects' on the left and 'Selective focus' on the right. A circle appears with dots at the top, bottom, left and right. Click and drag the centre of the circle to move it over the area to focus on and drag the dots to size it and shape it. **mm**

⌃ *Use the selective focus tool to blur unwanted backgrounds from images*

Linux Raider

Getting to grips with Lara on Linux

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

When *Tomb Raider* was rebooted for a new generation three years ago, it surprised many reviewers. For one, this was a well-balanced and decidedly well thought out game. Secondly, it was graphically impressive, with much praised physics behind the way Lara's hair moved in the gentle breeze of the mountainous regions of the island she was trapped on.

Amusingly, it was also credited for the voice acting and other sound effects, in that Lara, or rather her voice actor, did tend to grunt, groan and moan her way through the course of the game. Anyone listening to the game being played without seeing what was on the screen was often left with the impression that the player was in fact viewing something entirely different.

Anyway, the point is it was a pretty decent game. Now, three years later, it has finally been released for Linux through Feral Interactive and Square Enix. And what's more, it's being hailed as one of the best ports to the Linux platform ever.

Platform Leaping Lara

The required specification for running *Tomb Raider* isn't too bad either. You'll need either Ubuntu 14.04 or Steam OS 2.0 as a bare minimum, together with an Intel i3 or AMD FX-6300, 4GB of memory, 15GB space on your drive and an Nvidia 640 with 1GB of memory or an AMD R7-260X.

The GPU drivers tested and confirmed as working are version 364.12 for Nvidia cards and MESA 11.2 for AMD card users.

Obviously if you have better specs, then the game will be able to run at a higher graphical setting, but the minimum spec isn't too bad, and even on the lowest possible settings *Tomb Raider* still looks pretty good.

According to some users, the game is flawless on Ubuntu or Steam OS, and there's even support for the Steam Controller and Steam Link too.

More Games, Please

Gaming on Linux isn't everyone's cup of tea, that's fair enough, but you have to admit that having such prominent releases for Linux is going to help bring more positive attention to the platform. It's a shame that *Tomb Raider* took three years to get here, but since it's such a successful port and the Linux community appears to be extremely happy with the work done by the developers, perhaps that'll help convince developers that Linux is a viable solution – and more importantly a profitable one. *Tomb Raider* only costs £14.99 on Steam, but it's an amount

that many Linux gamers are happy to spend. If a new triple-A game is available for Linux along with the other platforms, then I'm sure there are countless Linux gamers out who are happy to pay the 40-odd pounds a new game costs.

So come on, game publishers and developers. If *Tomb Raider* is proof that Linux can cope with a triple-A game and that the community is behind it too, then give us some newer options – perhaps even *No Man's Sky* when it's released next month? Or even the latest *Battlefield* and so on?

Pushing the release of games to include Linux will undoubtedly improve driver support too. We won't hold our breath, but we're thinking positive thoughts.

For now, purchase, install and enjoy playing with Lara. Just remember to wear some headphones or you may get some odd looks from family members who overhear it!

▼ *Lara's on Linux, and she's looking pretty good too*

Are You A Quitter?

Craig Grannell wonders about the assumption that modern Mac apps should stay open indefinitely

When I think back to my first Mac, it's funny to recall just how much micromanagement went on. Every app would have a memory allocation manually defined. I'd periodically rifle through the system folder, to bin unwanted preferences files that were taking up space on the hard drive. And the second I was no longer using an app, I'd stab Command + Q to quit the thing.

As the years rolled on, this became even more important, because Mac OS wasn't the most stable of systems. So much as give Internet Explorer a funny look, and it would gleefully take the entire Mac down, forcing a restart, thereby costing you whatever was lurking unsaved in any other open apps. The lesson you soon learned was: never have anything lurking unsaved in open apps. In fact, don't have open apps. Instead, have an open app – singular.

OS X rescued Mac users from this kind of horror, and combined with the ridiculously rapid evolution of storage space, processor speeds and OS capabilities, this has led to a kind of complacency. This is in part because OS X – like any other desktop system – is designed to allow apps to remain open indefinitely. In general use, the idea is you just switch between the apps you want to use at any given time. In theory, a Mac could go for months between restarts, gradually amassing a huge set of open apps.

In reality, this doesn't work swimmingly, for a range of reasons. First, some apps aren't terribly well behaved, and nor are certain bits of OS X's plumbing. Right now, I use an app that has disagreements with iCloud Drive, resulting in semi-random spikes to a process that brings the Mac to its knees. Restart the offending app and the problem goes away – until the next time. There's also a basic usability issue, in that if you have dozens of apps open, finding one in the task switcher requires the kind of keen eye better suited to birdwatching than icon spotting.

A bigger problem, though, is self discipline. If an app is open, there's the temptation to use it. You might say to yourself you'll only do so for a minute, but then you'll suddenly notice it's dark outside and realise with a start you've spent most of the day buried in web forums or Twitter, and whatever deadlines you had haven't so much flown past your ears as spent several hours yelling into them before giving up and heading to the pub. And by 'you', I of course mean 'I'. Browsers, email, and social networks are clearly some kind of time-sink evil to be excised.

This is why I recently happily installed a new app by Marco Arment. The product is amusingly called Quitter, and it's insanely simple. You point it at specific apps, and then state that they should be hidden or quit after a specific period of inactivity. I've now got Mail, Messages, Safari, Slack and Tweetbot set to quit after I've not used them for ten minutes.

This is all faintly ridiculous, but it somehow works. Because the apps are rarely there for me to switch to, I spend less time in them. And psychologically, the act of launching them is a kind of red flag that time is about to be wasted. I now tend to launch these apps only for specific reasons (such as to contact someone), and they'll then lay dormant for ten minutes before Quitter does its stuff.

If you own a Mac and fancy being a bit of a quitter too, Arment's app is free and available from **marco.org/apps#quitter**.

▼ *Quitter: bringing a little sanity back to the Mac by regularly quitting potential time-wasters*

Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find **Craig** on Twitter at **@craiggrannell**

Mac

Micro Modular

Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

In the week that the Japanese synth pioneer Isao Tomita passed away, it seems somewhat fitting that one of his main instruments has seen a new life as a virtual recreation on the iPad. The 'Moog Model' synths were huge telephone exchange-like behemoths that were the first iteration of the synthesiser we know of today, and unlike the preset layout of later synths for ease of use, these were 'modular', meaning pretty much any part could be connected to another, creating a vast palette of sound. Moog modulars were used not only by Tomita, but by the likes of the also recently passed Keith Emerson, as well as Stevie Wonder on the likes of his Innervisions album. They sounded amazing, and were as adept at creating unheard-of sounds, as well as more traditional sounds too – a standout example being Carlos' retrofuturistic soundtrack to Stanley Kubrick's *A Clockwork Orange*. But they were as expensive as they were amazing, and even though rereleased last year, a new one will cost you $10,000 and up (an original costs even more). So they've become stuff of legend, but now you can own one for £22.99!

Of course it's not an actual unit, but a virtual recreation of the basic Moog Model 15 for the iOS platform. You get the same modules you'd have had you purchased one in 1969, plus a few extras for the modern age, and you can wire them together in any way you want with virtual patch cables, just like you could on a real Model 15. In fact, it even looks the same, with a gorgeous recreation of the original unit in full Retina glory. What's more (and this is very important), it sounds fantastic. It

has a certain warmth to it, a slightly uneven feel, and it evokes memories of those records and artists who used the real Systems in the past.

The Model 15, in hardware and software, is somewhat intimidating, even for someone with some production knowledge. It's a mass of dials, switches and sockets, and at first makes no noise at all. But, like the original, the iOS Model 15 is built with one ear to education, and as such has a series of tutorials to guide you through setting up your first 'patch' (a preset in old speak). True novices might struggle but if you have tried your hand at music and synths in the past, then you'll pick it up.

Moog Model 15 is actually one of the most advanced apps on the iOS platform, with Moog collaborating with Apple to iron out some audio issues, resulting in the 9.3.1 update. Computation of synths has come a very long way, with more CPU power becoming available, and on desktops there are synths that rival true analogue hardware for sound. With the Moog Model 15 on iOS, that high quality comes to

mobile (yes it's on iPhone too!), and in order to get as much of the CPU calculating audio, that gorgeous UI utilises iOS's Metal GPU instruction set to go straight to the chip.

It's not a solitary app either, with extra 'lines' in the synth to link in with inter-app audio, MIDI, even the new Ableton Link, though sadly it's not an iOS Audio Unit so far. Hooked up to a Mac via OS X El Capitan's Inter-Device Audio (the built-in method to stream audio from your iPad to your Mac), the Model 15's rich tone and easy MIDI controller assignment mean it finds its place easily in a modern production setup.

At first, the £22.99 price does appear prohibitive, and yes it is still a lot of money for an app. But for an instrument of this quality, even a similar virtual version for desktop costs five times that. With an iPad such as the Pro 12.9", the tactile UI rewards exploration with a huge and varied sonic palette, the sound far outweighing its cost. Simply put, the Moog Model 15 is a benchmark product in iOS audio.

Sounds Like Silicon

According to Andrew Unsworth, computers have revolutionised the production of music, and that's a good thing.

You may disagree with me, but combining musical instruments with computer technology was the one of the greatest moments in human history. You may curse the day that the sounds of guitars, trumpets and strings were accompanied by the sound of a delinquent Z80 having a tantrum, but I for one think it's brilliant.

To be honest, though, I remember the first home computer music programs being a wee bit cheesy. The first one I ever used was a C64-based piano program that came with an overlay that turned the C64's keyboard into something resembling an old joanna. I thought it was better than Magic Knight's silicon codpiece at the time because it played a rendition of the Beatles' 'When I'm 64' as a demo track.

Towards the end of the 80s, it was the venerable Atari ST that became the home computer of choice for music, mostly because it had a built-in MIDI interface that enabled users to connect MIDI instruments to it for use with software sequencers. Bands as diverse as Queen and 808 State used the Atari ST to record music, and the Atari ST was as at home in a music studio as it was running *Outrun* and *Black Lamp* in someone's bedroom. The IBM PC became the computer of choice in the mid-90s onwards, along with the Apple Mac.

Computers are now so powerful that even a modest and inexpensive PC can be used to run a virtual studio. Programs such as Ableton Live 9 (**www.ableton.com**), Steinberg Cubase (**tinyurl.com/4oroelq**) and FL Studio (**tinyurl.com/otj5usn**) are much more than the sequencers of yore, and can now produce credible acoustic instrument sounds and allow the generation of synthesised sounds, as well as control external instruments via MIDI.

Musical instruments have also changed to capitalise on the immense power of the modern computer. Modern musicians love the flexibility and convenience that computers provide, but still crave the tactility of a real instrument. As a result, this modern age has seen instruments such as Native Instruments' Maschine Studio, which is a combination of a high-end hardware controller with an equally high-end software program that allows users to play drums and other sounds, sample sounds and arrange music, among other things. Instruments such as the Maschine Studio provide the ordinary person with the sort of musical firepower that the composers of old could only dream about.

That last point is an important one too. Some people regard computer musicians or those who use modern instruments as cheats who press a button on a mixing desk to have a track automatically created for them by some silicon-based sentience. Indeed, I remember a friend's dad trying to convince us both of this very same thing, and me nodding my head politely in agreement, even though I knew he was wrong.

Computers provide users with the tools to make music, but producing a classic track that'll be remembered for decades still requires skill on the part of those users. People point to the long-dead composers and argue that they didn't use computers to make extraordinary music. While that's true, they would have used them had they been available. Hiring an orchestra to play your latest masterpiece is a rich person's game. Computers level the playing field by putting a virtual orchestra in the lap of the common person, and that's music to my ears.

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Hardware

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Gaming

Back To The Future

Call Of Duty adds transforming craft and dogfights in outer-space in the autumn's sci-fi infused Infinite Warfare

This week, Ryan takes a look at two very different franchise entries coming this autumn: Activision's Call Of Duty: Infinite Warfare and EA's Battlefield 1...

Plug & Play

Bigger, louder, faster. How do you keep players coming back to the same shooter franchise year after year? *Call Of Duty*, the king of the FPS hill for the past decade, has moved from past to present with the World War II-set *CoD* giving way to 2007's *Modern Warfare*. *Battlefield* has diversified along similar lines, with the likes of *Battlefield 1942* contrasted with the contemporary war settings of *Battlefield 4* and the urban cops-versus-robbers antics of *Battlefield Hardline*.

This year sees Activision and EA's rival franchises diverge more dramatically than ever before. *Call Of Duty: Infinite Warfare* sees the series blast off into pure sci-fi territory. The simply titled *Battlefield 1*, meanwhile, heads back to the start of the 20th century and the horrors of World War I.

Infinite Warfare was unveiled first on 2nd May, and even compared to the Exoskeletons and holographic displays of Sledgehammer's *Advanced Warfare* from last year, this latest offering is high-tech stuff. Set in a far-flung future of space colonisation, it mixes traditional ground-level action

with aerial combat for the first time. *Battlefield* players have long been used to taking to the air in their skirmishes, of course, but Infinity Ward's shooter has a bit of a twist up its sleeve: *Infinite Warfare*'s go-to craft is the Jackal, a transforming fighter jet, which is capable of combat in the skies of good old terra firma and also in outer space.

Speaking to IGN, design director Jacob Minkoff reveals that the flight sequences will be "seamlessly" folded into the game. He suggests that we'll be able to hail our Jackal at any time, and that we'll be able to fight in terrestrial streets one minutes and hurtle off into space the next.

Perhaps realising that *Infinite Warfare* is quite a departure from the pattern set by previous *CoD* games, Activision is also packaging a high-def *Modern Warfare Remastered* exclusively with special editions of this year's main event. Whether this will be enough to assuage long-term fans remains to be seen. There's been a ripple of negative comments directed at *Infinite Warfare* so far; in fact, its first trailer is the most disliked game promo on YouTube at the time of writing. Understandably, Activision's CEO, Eric Hirshberg,

has remained upbeat in the face of it all. "We know there are people in our community who are nostalgic for the boots on the ground-style gameplay; that's why we made *Modern Warfare Remastered*," Hirshberg told his company's investors in early May. "But we also have millions of people in our community who want to have new innovative experiences in the game each year, and *Infinite Warfare* is going to deliver that."

Online

If *CoD* players really are nostalgic for the "boots on the ground" multiplayer action of the earliest entries in the series, we may see at least a few of them defect to the EA camp in the autumn. While *Battlefield 1* will also include a single-player campaign, its main focus will once again be on its multiplayer, with its 64-player battles taking place in the muddy trenches and grey skies of Europe, at sea and in the deserts of Northern Africa.

Clearly, no expense has been spared in the first trailer's evocation of a bloody war and its machinery. There are biplanes, tanks, airships, soldiers on horseback and battleships riding great swells in the ocean. All

▲ *EA is heading back to the early 20th century for Battlefield 1, a multiplayer tour of World War I from the fields of Europe to the deserts of North Africa*

these animals and vehicles, we've learned, will be controllable in the game. In a surprising commitment to realism, EA is remaining faithful to the unique lopsidedness of the Great War, where mechanised combat sat uneasily with older forms of combat like swords and war horses. The trailer also hints at the same scarcity of munitions and desperate, hand-to-hand combat that made the ground war in Europe such a grim moment in 20th century history.

Realism aside, EA Dice maintains that *Battlefield 1* will remain as fast-paced and fun as the best moments in earlier entries.

"With the variety of stuff that's available, we can push and keep the pace you see in previous *Battlefield* games," the game's lead designer, Daniel Berlin, recently told VentureBeat. "We can also deliver the kind of rock-paper-scissor gameplay you're familiar with. It's a good fit [...] It's a common misconception that they were still just using single-shot rifles, and that's not true. Everything you saw in the trailer, those were real

weapons used by soldiers in this time period. Shotguns, pistols, automatic rifles, everything."

Exactly how developer EA Dice will balance making a gamer-pleasing hit with the oppressive atmosphere of trench warfare are currently unclear, but we can't help admiring the bravery of *Battlefield 1*'s back-to-basics approach. But then again, both Activision and EA are taking fairly major risks with their respective franchises. Are *CoD* players ready for zero-gravity combat and outer-space dogfights? Is there a broad enough market for a shooter set over a hundred years in the past? Those are questions that neither publisher will know for sure until the autumn.

Battlefield 1 is due for release on 21st October, while *Call Of Duty: Infinite Warfare* is out on 14th November.

Incoming

For Epic Games, the future is free-to-play multiplayer. The developer may have enjoyed a massive success with the *Gears Of War* franchise (which is now continuing under the care of

Microsoft Studios), but it's recently pledged its dedication to projects like *Paragon*, the forthcoming third-person battle arena game that recently entered early access. That game, plus its other forthcoming project *Fortnite*, represent a move away from the traditional publisher-led retail model. "We were seeing some of the best games in the industry being built and operated as live games over time rather than big retail releases," Epic's CEO, Tim Sweeney, recently told Polygon.

Epic certainly has the pedigree when it comes to multiplayer blasters, but it also has plenty of competition in the increasingly popular hero shooter subgenre. Gearbox's *Battleborn* launched on 3rd May, while Blizzard's eagerly awaited *Overwatch* comes out on 24th May. All are defined by their colourful characters, varied abilities and MOBA-like competitive play. But with *Battleborn* currently priced at £39.99 (plus £15.99 for a DLC season pass) and *Overwatch* set at £44.99, *Pargagon*'s free-to-play status may just give it the edge.

Paragon is due out later this year.

▲ *Epic has committed itself to a future of free-to-play multiplayer games like Paragon, its forthcoming arena shooter*

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HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad to MicroMartClassifiedAdverts@gmail.com and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

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Email: johnrpeel@gmail.com

WANTED: Gigabyte GA-Z77X-D3H motherboard wanted.
Email: johnbeiry@gmail.com

WANTED: PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.
Tel: Bill (07742) 061569 or (02641) 769503.

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Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
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SOFTWARE WANTED

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Wanted: Quicken 2001. I desperately require a copy of QUICKEN 2001, UK Edition. I need to reinstall the program but have lost my original installation CD.
Email: david.maddams@icloud.com

ASK AARON

Printer Jam

I have a major problem with my Windows 8 PC and printer that I'm hoping you can help with. For some reason, during a print job that ended up in a printer jam, my printer has now decided to never print again. I cleared out the paper jam, as advised by both Windows and my printer's screen, and reset the printer itself. After this, the printer said it was ready, but when I try to print within Windows, nothing happens.

After looking around, I found the printer queue, which appears to have a couple of jobs still in it (even after a reboot). I've tried cancelling them, but no matter how long I wait, nothing happens. Windows just won't let go of the jobs, and because of this I cannot print. At least, that's what I think is causing the issue.

Is this correct and, if so, how can I fix it? I have to do a lot of printing, so as you can imagine, I'm a little concerned and would really welcome your input.

Kevin

It would appear as though the problem you have is down to Windows' printer spooler. This is where Windows holds the queued up printer jobs you can see when you look at the printer queue window on the taskbar. Sometimes, following a printer jam or other error, these jobs can become stuck, and the printer spool can crash. This is what causes the inability to delete jobs.
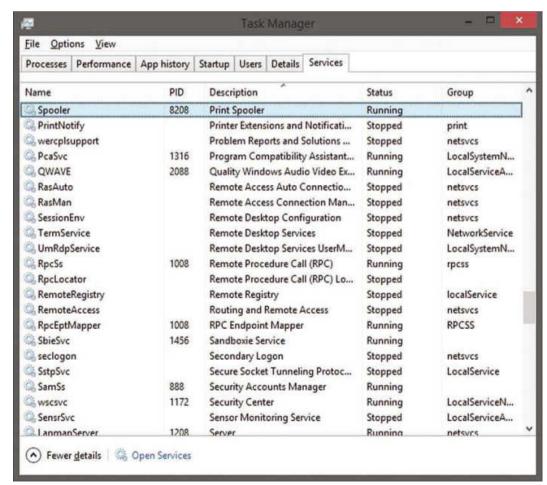
To fix this, you can manually remove the jobs from the print spooler within Windows. To do this, the print spooler service first needs to be stopped. Press Ctrl+Alt+Del, and go to the Task Manager. Click the Services tab, and browse down the list to find the Spooler entry. Right-click it and select Stop. This will stop the printer spooler and will allow you to manually remove items from the printer queue.

To find this, browse to C:\windows\system32\ spool\PRINTERS (or another drive if Windows isn't installed on C). In this folder you'll see the various jobs currently sat in the queue, including the ones that are stuck and causing your problem. Delete these jobs as you would any other file, and then close the folder.

Now, go back to the Services window and right-click the Spooler service. Select Start, and then close the Task Manager.

With the print spooler cleared and the service restarted, you should now be able print as normal, and the Task bar monitor will have no jobs stuck in the list. If the problem happens again, simply repeat the process.

⌄ *If you need to manually clear the printer queue in Windows, you'll need to stop the spooler service*

Name	PID	Description	Status	Group
Spooler	8208	Print Spooler	Running	
PrintNotify		Printer Extensions and Notificati...	Stopped	print
wercplsupport		Problem Reports and Solutions ...	Stopped	netsvcs
PcaSvc	1316	Program Compatibility Assistant...	Running	LocalSystemN...
QWAVE	2088	Quality Windows Audio Video Ex...	Running	LocalServiceA...
RasAuto		Remote Access Auto Connectio...	Stopped	netsvcs
RasMan		Remote Access Connection Man...	Stopped	netsvcs
SessionEnv		Remote Desktop Configuration	Stopped	netsvcs
TermService		Remote Desktop Services	Stopped	NetworkService
UmRdpService		Remote Desktop Services UserM...	Stopped	LocalSystemN...
RpcSs	1008	Remote Procedure Call (RPC)	Running	rpcss
RpcLocator		Remote Procedure Call (RPC) Lo...	Stopped	
RemoteRegistry		Remote Registry	Stopped	localService
RemoteAccess		Routing and Remote Access	Stopped	netsvcs
RpcEptMapper	1008	RPC Endpoint Mapper	Running	RPCSS
SbieSvc	1456	Sandboxie Service	Running	
seclogon		Secondary Logon	Stopped	netsvcs
SstpSvc		Secure Socket Tunneling Protoc...	Stopped	LocalService
SamSs	888	Security Accounts Manager	Running	
wscsvc	1172	Security Center	Running	LocalServiceN...
SensrSvc		Sensor Monitoring Service	Stopped	LocalServiceA...
LanmanServer	1208	Server	Running	netsvcs

HDMI NAS

The review of the Western Digital Ultra NAS Box prompts me to ask your help.

My desktop PC has hot-swap caddies, which contain hard drives with my downloaded movies and which I can remove for use elsewhere. However, I cannot connect them to my cinema system as there is no HDMI connection. My need is for a NAS box that accepts PC drives as does the WD Ultra NAS Box, but which has an HDMI output that can be connected to my TV or projector for screening directly the content, without relying on something like a Blu-ray player or STB, which only has USB inputs.

Do you know of any such component that would meet my needs? I shall be most grateful for your advice.

John

It's surprisingly difficult to find a NAS unit that includes an HDMI output, especially given the connection's popularity and perfect fit for media centre devices – something that many use their NAS units

for, for obvious reasons. However, there are some around, including ones that also feature the option to insert your own hard disks, which is exactly what you need. They can be a little expensive, though.

One option is the QNAP TS-451. Available online for around £300, this is a four-bay unit and is a high-end home NAS that also functions as a media server. It has the required HDMI, of course, and the included OS is very easy to use. DLNA, AirPlay and Plex are supported, and mobile devices can be used too.

Another option you might want to consider is the Netgear RN31400-100EUS ReadyNAS. This is another four-disk unit, and it also includes an HDMI port for connection to an external entertainment system. It's graced with a high level of security, backup software, DLNA, iTunes and Plex support, and it has anywhere cloud access. It should cost around £380, so is more expensive, but it does pack in more features.

➤ *There aren't many HDMI-equipped NAS units, but you can find high-quality models*

My First Laptop

I'm looking for a way to get my youngster (aged five) into computers. I want to give her a good start before she needs to get involved with them in school, as I feel computers are so very important in education, and I want her to be well equipped.

I don't really want to buy a normal laptop for her, though, as she's still very young, and laptops are hardly cheap and are very fragile. She's a very careful child, so I'm not too worried that she'll throw it or intentionally damage it, but she's also young, and accidents do happen.

Can you recommend any specific laptops that would fit my needs without costing too much?

Ed

It's a good idea to introduce computers to your child early on. They're superb aids for learning, and when it comes to hand-eye coordination, they're also very good. Simply teaching language and spelling is also something computers are proven to be of great help with.

The concerns you have are very real and, yes, computers aren't the most child-friendly

(or vice versa), and they're also expensive. There are some models that are more suitable, though. One such option is the Goldengulf Mini Android Laptop Netbook. It's a bit of a mouthful, but this mini laptop is designed to be small and affordable, and it's excellent for young children.

It's small and lightweight, so it's easy for children to carry, and the Android OS is far easier to use than Windows and is easily tailored by an adult to cater for a child's needs. As it's Android, there also no shortage of apps available via the Google Play store, paid and free.

Another well-suited laptop is HP's Stream. This is another lightweight model, which has a larger screen than the Android model, but it's still a good size for children. It's also durable, so it's perfect if your child needs to take it with them to school in a bag or cart it around to a friend's house. It runs Windows, so it's more flexible, although this may make it more suited for older children, as it's a full OS.

▼ *You can find some laptops that are better suited to younger children*

ASK JASON

All Or Nothing?

I've just upgraded from Windows 7 to Windows 10, but I wasn't given any choice over what to keep. All my old data's still there, and I think some old apps are too. My plan was to use the upgrade as an opportunity to start afresh, getting rid of years of accumulated junk. I'd backed up accordingly. Never mind, I thought – I'll just do a reset from within Windows 10. However, when I try this, picking the 'Remove everything' option, I get the following error: 'There was a problem resetting your PC. No changes were made.' Then there's just a Close button. Help!

Pete Edwards, Virgin Media

I've had this happen too. Have you tried the 'Keep my files' option? I know this isn't what you want, but you'll probably find there's no error with that. And once it's done, you can go back and try 'Remove everything' again. I've played this game before and won. But not always. By my reckoning, you'll have a 50% likelihood that 'Remove everything' still won't work.

*If you're still in trouble, Pete, consider watching this YouTube video: **goo.gl/RCHslV**. Ah, no, sorry – that's the wrong one (don't try this at home!). Here's the one you want: **goo.gl/Cqhm5h**. This explains how to weave some trickery that will get 'Remove everything' up and running (allegedly). The process involves a file called 'install.wim', but after searching your hard drive you may find all you have is 'install.esd'. The following page describes how to convert between the two (read it to the end): **goo.gl/A4lcfk**.*

*For me, though, I decided long ago that it's all too much like hard work. No-one seems clear on why the problem occurs – least of all Microsoft – and solutions such as the one above may or may not bear fruit. What I'm saying, I think, Pete, is that you'd do well to visit this page instead: **goo.gl/gjsCsu**. Run Microsoft's media-creation tool, download the relevant Windows 10 ISO to a USB stick, and simply perform a completely clean install. Life's too short.*

▼ *Another error message that reveals absolutely nothing about the underlying problem*

There was a problem resetting your PC

No changes were made.

Close

Pin Money

Back in issue 1,351 (February 2015) you gave me some advice regarding my Core 2 Duo system. I took it and replaced the main parts with an Asus Z97-P, some DDR3, and a Core i3-4330 (LGA 1150). Last month, though, the motherboard died. As it was under warranty I returned it to the retailer, but I've just heard back that the warranty's void – it seems I bent some pins in the CPU socket when removing the cooler.

For future reference, what's the best way to get CPU and cooler apart without causing damage? And on another note, given than I'm not a gamer or overclocker, I probably don't need an all-singing Z97-based motherboard. What would I be missing if I dropped down to a B85 chipset or even an H81 chipset?

Ryland Perrin, Gmail

Very bad luck. Intel CPU sockets are certainly fragile. Even so, how on earth did you manage to damage yours simply by removing the cooler? When a cooler's detached, the socket's pins remain covered by the CPU, which is locked solid by the clamp. Damage should be impossible.

Are you sure you didn't knock the pins when the socket was empty, perhaps with the backplate when boxing the board up to send back? Easily done. It's also the work of a moment to inadvertently drag a shirt sleeve over a socket, and if a loose thread tugs at some pins – well, all bets are off.

My advice when returning a faulty motherboard is to take some photos first. I'm not suggesting it's gone on here, but it's not unknown for sellers to damage boards themselves. Sometimes this might even be deliberate, in order to renege on a refund. Cynical? Me? When there's money involved, you bet.

I agree about Z97, Ryland. If you're not overclocking, there's usually no point. But what's lost when buying a board based on, say, B85 or H81? First, there's no support for M.2 SSDs – on LGA 1150, only Z97 and H97 have that. Second, though only in the case of H81, the graphics slot can only be wired up for PCIe 2.x, not PCIe 3.x. As
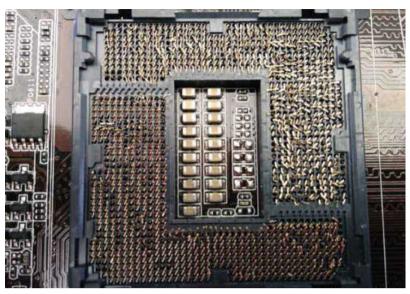
you're not a gamer, this isn't important. Even if you were a gamer, any performance drop would still likely be non-existent, as I reported in issue 1412 (see the benchmarks at **goo.gl/Smfa3R**).

Also, H81 has six PCIe 2.x lanes, used for non-graphics slots and internal ports. All other LGA 1150 chipsets have eight. Some chipsets see a reduction in supported SATA-3 ports too: two for H81 (plus two SATA-2 ports); four for B85 and Q85 (plus two SATA-2 ports); and six for everything else (no SATA-2 ports). Some chipsets also support fewer USB 3.0 ports (all support eight USB 2.0 ports): two for H81; four for B85; and six for everything else.

Of course, extra ports are sometimes added to motherboards via third-party controllers. Furthermore, extra ports can usually be added via expansion cards. If you think you'll need to do that, however, Ryland, you'd be better going for a higher-end board to start with.

➤ *Oh dear, oh dear, oh dear*

Ring The Changes

I'm trying to become a Windows 10 Insider! As I understand it, I'd get new features before they're released to the general public. But how? I can see references to preview builds in Windows' settings, but I'm not much further forward than that. Do I have to register first? Can anyone join?

Nick, Gmail

Anyone can join the Windows Insider Program, but, yes, you need to register. Visit insider. windows.com and click the Get Started button. On the subsequent page, sign in with your Microsoft account – create one if necessary. After that, agree to the terms, tick a couple of boxes, and click Submit.
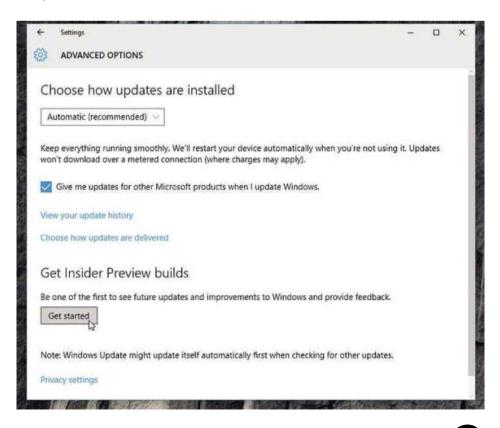
You can now configure Windows. Click Settings > 'Update & security' > Windows Update and hit the 'Advanced options' link. In the new window, below 'Get Insider Preview builds', click 'Get started'. On the warning screen, click Next, and on the get-out-while-you-still-can screen, click Confirm. Your PC will then need restarting.

Once you're off and running again, Nick, get back to the 'Advanced options' page and pick one of the three update 'rings'. On the fast ring, you'll receive updates before they've been properly tested; on the slow ring, you'll receive updates from the fast ring that have since had major issues ironed out; and on the release-preview ring, you'll receive updates from the slow ring that are now pretty much ready for regular release.

Clearly, if you opt for the fast ring, you'll be at the cutting edge, so expect bugs, instability, and crashes. Conversely, if you opt for the release-preview ring (the default), you'll be

merely an early adopter of updates you'd receive soon enough if you weren't on the Insider Program at all. Common sense says the slow ring is the best choice. To my mind, though, Nick, why bother in the first place unless it's to jump in head first?

If there's a time you no longer want to be an Insider, just revisit the 'Advanced options' page and follow your nose. It can take a day or two for an update ring to fully kick in (chiefly because there'll be a ton of stuff to

download and install), and likewise it can take a day or two for Windows' update system to revert to normal after an opt-out. Of course, Insider updates already in place – together with any problems – will still be in place. As an Insider, don't use a machine you rely on for daily use, and be sure to create regular restore points and backups.

⌄ *Want to be ahead of the game with Windows updates? Here's how!*

Crowdfunding Corner

Your smartphone's camera might be good, but with a little modification it could be so much more – at least that what this week's Kickstarter choices reckon

Flens

Most high-end smartphones now incorporate an LED flash that can also be used as a torch or flashlight – but those lights are inexact and short range, limiting their use. If you want to change your phone's LED light into a more powerful tool, the Flens accessory is exactly what you need.

Designed to focus and extend the range of your LED flash, the Flens attaches to the back of your phone and contains a lens that gives you a more direct beam. As a result, you can shine the light more tightly and illuminate things that are metres away instead of inches. It can even be used to give you better illumination at a distance when taking photographs in the dark.

The flens is engineered for iPhones, but works with a variety of Android devices too – there's a list on the Kickstarter page in case you're unsure. It attaches magnetically to a thin metal washer that adheres around the flash, and comes with a keyring attachment so you can keep it safe when you're not using it.

Backers can get their hands on one for €19 (£15), and that package includes the keyring, two shapes of washer and the lens itself. Buying the kickstarter package saves you €11 (£8.50) on the retail price, while higher tiers allow you to get a protective box for the lens or discounts on multiple ones. The campaign has hit 25% of its goal after one day, so we don't expect there to be any problems getting it over the finish line – and if it does, your lenses should be with you by July. Not bad!
URL: kck.st/2200J35
Funding Ends: Friday, June 10th 2016

Blips

Smartphone photography is better than it's even been, there's no doubt about that. However, if you're trying to capture extreme close-up detail with your smartphone's lens, you're usually out of luck – unless, of course, you want to carry around an expensive and fiddling lens kit all the time.

Blips is different, though. These re-usable magnification strips are literally paper-thin and stick onto your phone, magnifying the lens to the point where you can use your phone as an actual microscope if that's your wish.

The Blips lenses come in two strengths of magnification: macro and micro. The latter will supposedly allow you to distinguish details up to a miniscule four microns in size. Indeed, the example pictures on the Kickstarter page have to be seen to be believed, if we're honest.

We're assured the strips work with virtually any device and are designed to be cut and shaped to fit any phone. Each basic kit (which you can get for €20, or £16) comes with both lenses and sponges to help you get the right focal point for them. Higher tiers include extra kit to aid your photography, like a smartphone stand, slides, and more, and every level gets you the associated Android/iOS app for free as well. Packages are expected to ship in September this year.
URL: kck.st/1Ws8b75
Funding Ends: Friday, June 24th 2016

Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Distiller – Whiskey Companion

David Hayward tastes a glass or two of the true water this week

Whiskey, the true water, they say, tastes infinitely better when in the company of good friends. When sampling a large gold watch, there's nothing quite like tasting the distinct varieties on offer, to get the nose for the various blends and to enjoy the full flavour of the spirit.

There's a lot of joy to be had from tasting a well-blended whiskey, but the sheer number of brands available are enough to confuse even the seasoned professional. This is where Distiller can come in handy.

Distiller
Distiller is an app for the whiskey connoisseur, a personal companion that can help you discover new flavours and the unique characteristics of each blend and bottle you'll come across.

It allows you to rate a whiskey you've discovered, while at the same time offering you access to a vast network of other whiskey lovers reviews and ratings. It can offer personalised recommendations, based on your own tastes or via a simple review of the other bottles you've sampled in the past.

There are also options to allow you to take your own notes on different bottles as you document your whiskey journey, plus it offers you the chance to share your discoveries, ratings and other whiskey-related documentation via the usual social media outlets – which, as Distiller states, makes a not-so subtle hint to others for the perfect gift for you.

Links To The Main Site
Distiller mainly links back to the main Distiller site, where there are even more recommendations, well over 10,000 apparently, as well as an intricate story of whiskey (or whisky or even Scotch, depending on your point of view and where your sample is from) to read and learn from.

Features At A Glance
- Personalised recommendations.
- Rate bottles for tailored whiskey suggestions.
- Add favorites to your Top Shelf.
- Share your list as a not-so-subtle hint for the perfect gift!
- Write your own tasting notes to document your whiskey journey.
- Unique Distiller Rating from the Tasting Table whiskey expert panel.

There's a blog, with the latest whiskey information, along with links to various whiskey-related trade events throughout the globe, and options to further discover the various flavours from the two biggest whiskey consuming countries: USA and Japan.

The app also now includes reviews of rum, brandy and even tequila.

Conclusion
Needless to say, there's plenty to tantalise your taste buds with here. Whether you're looking through the main site via the app or just using the front-end UI to navigate through the many reviews of whiskeys, you'll no doubt find something worthwhile.

For the whiskey drinker, Distiller is an interesting combination of views from enthusiasts from the world over. So if you're the type who loves your golden nectar and can quite happily tell the difference between whiskey and whisky, then perhaps Distiller is the place to hang out and share the information you've gathered over the years.

Of course, drink sensibly and enjoy the blend as it was designed: to be savoured and with good company. **mm**

▲ *Find your ideal blend through the vast numbers available*

▲ *You can customise your search by answering various questions*

▲ *Review and find reviews for over 10,000 blends and bottles*

Logging Off

Technology often throws up really peculiar stories, but those surrounding the identity of Bitcoin creator Satoshi Nakamoto push the boundaries of bizarre. This marble run re-started when Australian Craig Wright told journalists from the BBC, *The Economist* and *GQ* that he was responsible for creating Bitcoin's initial concept and code. Great, well done Craig, can we move on now? Because let's be honest, who cares who created Bitcoin, or Paypal – or who designed the 10p piece?

It might have been news when Bitcoin was created, but eight years down the road from its inception and a good few without its creator holding the tiller, it amounts to little more than a footnote scribbled in the margins of tech history. It's worldwide news because, despite his assertion that he was 'Satoshi Nakamoto' being supported by Gavin Andresen, the chief scientist at the Bitcoin foundation – or, rather Andresen confirming that Wright had code keys that only Satoshi could possess, allegedly – people soon began to punch large holes in the evidence he had put forward to back up his claim.

Then, the story began to spiral out of control as allegations of a scam began to be put to the Bitcoin cognescenti, some of whom had seemed adamant that this was the man. The problem is, none of them – except one, an uncorroborated claim by one Joseph Vaughn-Perling that he met Wright, working under the pseudonym of Satoshi Nakamoto as far back as 2005 – actually claim to have met the man, or are able to visually confirm his appearance.

If you can accept a 'chief scientist' who has never met the reclusive character who invented the project he's working on, I suppose this all makes perfect sense.

The core of the issue is that there's no definitive way to prove someone is Nakamoto. However, in terms of how Wright tried to back his claim, the transaction he offered as an example (between Nakamoto and Bitcoin engineer Hal Finney, who is inconveniently deceased) immediately rang alarms. The key that Wright provided, you see, is a matter of public record, and not remotely secret.

So, stung by the world's cynicism towards his bravery in coming forward, Wright declared that he was provide further evidence that would "lay the foundations for this extraordinary claim."

What was required was a transaction using an Bitcoin block that wasn't on public record, one from the massive stash of early Bitcoins that only Nakamoto would have access to. It sounded simple enough in priciple, but he failed to provide it. At this point, many more people smelled a rat.

Turns out that PGP keys he'd used previously were faked, his Ph.D. incomplete, the SGI supercomputers he claimed to have used do no correspond to any sales record at SGI, and his long list of achievements on LinkedIn has been abruptly deleted. Then came another statement from Wright, with the rather cryptic claim that, in a sort of inverted version of Spartacus, he didn't in fact "have the courage" to prove he was Satoshi Nakamoto.

I'll go out on a limb to say Craig Wright isn't Satoshi Nakamoto, and the person who is must have found this farcical episode more than hilarious. What that person undoubtedly understands is that his identity isn't important, in the way that we're all happy to use coins without knowing the name of the man who minted the first.

The credibility of Bitcoin isn't based on us getting a positive vibe about those that created it, but in it actually functioning as a currency, surely?

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Configuration, **8** Triton, **9** Famous, **10** RAM Disk, **12** Screw, **14** White, **16** Reports, **19** Urgent, **20** Isobar, **22** Psychokinetic.
Down: 1 Four, **2** OFSTED, **3** Agonise, **4** Draft, **5** Atomic, **6** Document, **11** Aphorism, **13** Pebibit, **15** Trench, **17** Ogonek, **18** Ethos, **21** Acid.

THIS WEEK'S CROSSWORD

Across
7 Relating to audio transmitted through four channels (13)
8 An effect whereby the sound produced by an amplifier or an amplified musical instrument is made to reverberate slightly. (6)
9 Small handbills advertising an event or product. (6)
10 A cold-cathode gas-filled tube intended for use as a very high-speed switch, somewhat similar to the thyratron. (7)
12 An instrument probe that automatically transmits information about its surroundings underground, under water or in the atmosphere. (5)
14 The layout engine developed by the Mozilla Project. (5)
16 American businessman and computer pioneer who co-founded Computer Sciences Corporation and was a co-creator of Fortran (3,4)
19 The quality of being lively, vivacious, or witty. (6)
20 Patch up or renovate. (6)
22 A belief that priests can act as mediators between human beings and God. (13)

Down
1 Extremely large; enormous. (4)
2 Industry standard investment management software for asset managers and hedge funds. (6)
3 Notebooks manufactured by Apple from early 2006 to late 2011, and relaunched in 2015. (7)
4 The key on the typewriter keyboard that changes from lower-case to upper-case letters. (5)
5 A colour between blue and violet. (6)
6 Give authority or sanction to someone or something when recognised standards have been met. (8)
11 An electrical instrument used to control a current by varying the resistance. (8)
13 Archaic term for worries. (7)
15 The most basic level or core of an operating system, responsible for resource allocation, file management, and security. (6)
17 Manufacturers of the GroupWise enterprise collaboration system. (6)
18 Preliminary drawing for later elaboration. (5)
21 The topology of a network whose components are all connected directly to every other component. (4)

Top 5 Horrible Technology Noise

As well as being hard to spell, onomatopoeia can also be bad news for your gadgets

1 Bang

Often accompanied by a puff of smoke, a massive spark and the smell of burning plastic, the bang is a noise that first makes you jump and then makes you cry, as you realise some part of your computer (probably your power supply) has just dramatically popped its clogs and given itself an impromptu cremation.

Thankfully, this is a relatively rare phenomenon, but it often comes without warning, so there's no advice we can give you about how to prepare for it.

2 Grind

As we move increasingly towards mobile devices and solid-state storage, the number of moving parts we encounter in our daily computing experiences has fallen significantly. But PC users still have to contend with various fans and often traditional platter-based hard drives. Luckily, when a fan stops working, it doesn't really cause much of a problem, and it's easy to swap out.

When a hard drive goes, however, it can be a real pain, first causing system instability and then ultimately ending in data loss. The good news, though, is that mechanical drives often give you warning signs before they fail completely, and one of these is a grinding sound. Catch this early, and there's a chance you can still use the drive long enough to make a backup. But once your hard drive starts making this noise, it's probably long for this world.

3 Squeal

In our experience, other than speaker feedback, we've only ever come across the squeal when we've had a graphics card problem. Usually, this was because we forgot to plug in the GPU's auxiliary power or just forgot to insert the card at all before attempting to boot our computer. But on one occasion, it was due to a graphics card we found lying around the office, which turned out to be hopelessly defective.

If you've never heard this noise, then consider yourself lucky. With only the slightest amount of hyperbole, we can say it's roughly akin to the sound of a banshee singing along with the Gun N' Roses back catalogue while simultaneously running her nails down a blackboard.

4 Crack

Generally, consumer technology is fairly robust, if treated with a reasonable amount of respect. But accidents happen, and far too often that ends up with it being dropped or something being dropped on it. In the case of a mobile device or a monitor, the thing that cracks is either a layer of glass, an LCD screen or, more likely, both.

But it's not just our screen swe have to worry about breaking. Cracking noises also signal the death of a hastily pushed RAM module, a DVD you've just sat on or the pen drive that catches on your leg and rips out the USB port.

5 Splash

Whether it's a puddle or a pint, splashing noises are rarely good when heard in the vicinity of consumer technology – and we can say that from personal experience. To date, members of the Micro Mart team, past and present, have managed to destroy a new PC by spilling beer inside it and killed a phone by dropping it into in a pint of lager.

And just to prove that all our mishaps aren't preceded by the consumption of alcohol, another MM team member dropped their phone into a toilet (while sober).

Thankfully, though, waterproofing on mobile devices is becoming more common, so at least some of our gadgets are protected from our clumsiness. **mm**

⌃ *A broken graphics card or Axl Rose's voice?*